SCIENTIFIC AMERICAN

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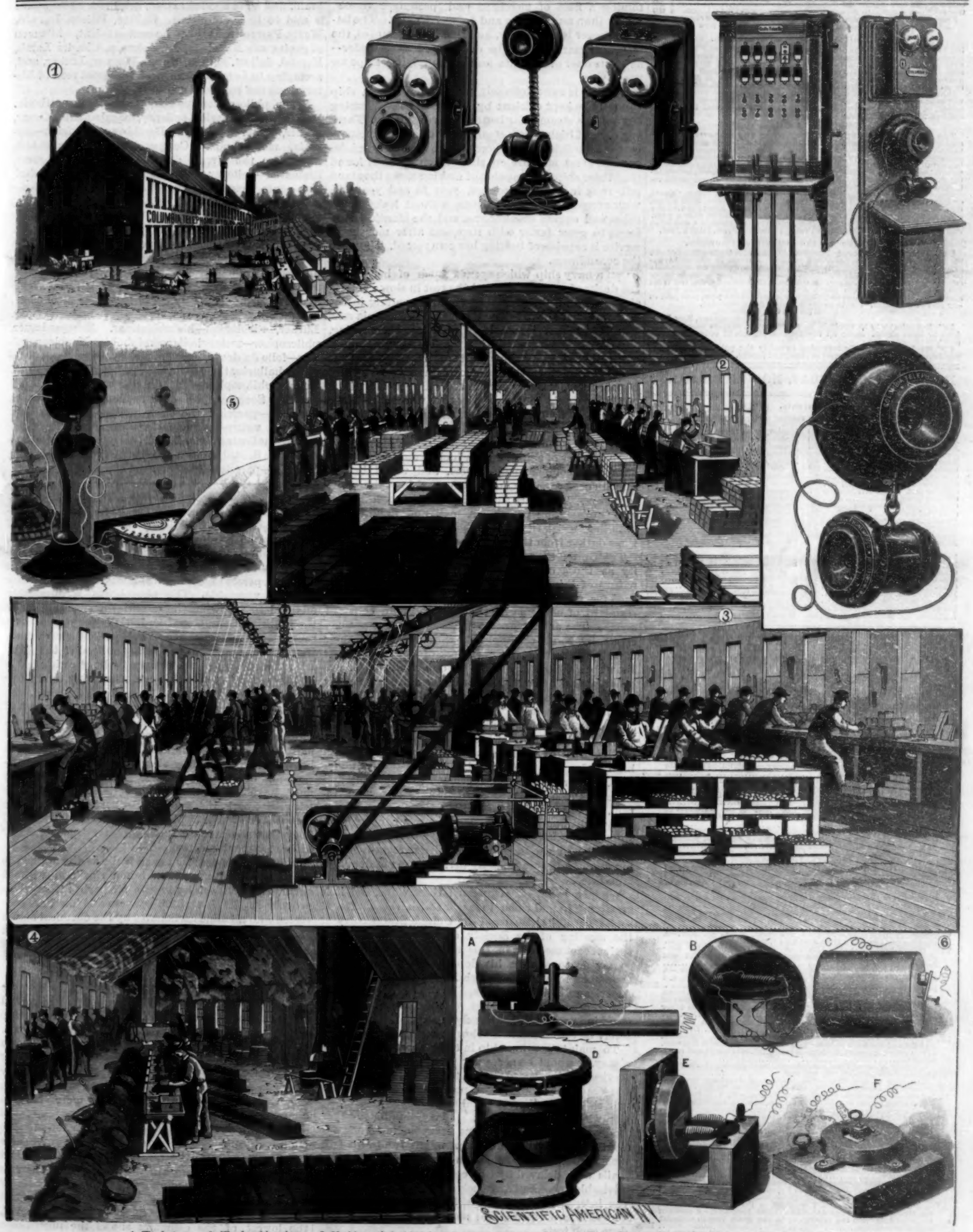

1. The factory. 2. Woodworking shop. 3. Machine and electrical department. 4. The foundry. 5. Transmitter, receiver, and switch. 6. Early telephones.

THE COLUMBIA TELEPHONE SYSTEM—ITS FACTORY AND INSTRUMENTS.—[See page 327.]

Scientific American.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 986.

For the Week Ending November 24, 1894.

Price 10 cents. For sale by all newsdealers.

THE NEED OF EFFICIENT VESSELS FOR THE NAVY.

The recent launch of the American Line steamship St. Louis, from Cramps' yard at Philadelphia, marks, it is to be hoped, the beginning of the creation of a new American mercantile navy. While much has been said and written about our white squadron, and while frequent allusions have been made to the new navy now fairly in being, our feelings of satisfaction might have been properly tempered by the realization of the fact that our work was but half done. The role of America, with her great sea coasts and immense exporting interests, should be the peaceful one of maintaining a fleet of merchant and passenger vessels, rather than an offensive and defensive navy. The latter however is a necessity, and this being granted, the merchant marine should be encouraged as its feeder—as the trainer of recruits and as supplying ships for use in war.

Nothing is more definitely proved than this—a ship can only be kept efficient by constant use. Wearing out befits a steamer far better than rusting out. There is a class of high speed steamers run for their money-earning qualities, and whose powers in this regard depend in great measure on their records. It is found that these ships are capable of making three thousand mile runs in quick succession, year in and year out, with exceedingly few accidents, without leaky boiler tubes and engine breakdowns, and the identical ship seems to grow faster with time, and after months of service is capable of beating her own record. These are the ocean liners.

Can a navy ship which spends much of her life at the docks of a navy yard and the rest in slow cruising about the globe be expected to hold a standing in the class outlined above? The Campania or Lucania relegated to such service would at once lose their rating, and their standard would fall. A speed premium is generally earned by ships built for the navy, and the knots and fractions thereof shown in a two or three hours run are proudly announced. But such a trial is not comparable to the services of the transatlantic liners, each of whose runs across in the face of the competition for records is a virtual speed trial of the most exacting description. In the event of war there are a large number of ships afloat which would play with our fastest commerce destroyers, and would in sustained speed capacity outclass every ship of the white squadron. These are ships which are in constant service transporting passengers, mail and freight, with unfailing regularity and unhampered by any traditions dating from the days of sailing ships.

The United States can build ships of as good quality as those of any other nation. But from the nature of things a war ship pure and simple and used for no other service cannot maintain the same standard of efficiency as that of a vessel in constant service. The naval maneuvers of the different powers, especially those of England, show this. In their squadron practice the members of the fleet never show their full rated speed, and one trouble after another affects the machinery or boilers. The passenger ships of a transatlantic line could never do business on any such basis.

In case of war we shall have to look to the American Line for some of our best naval material. Here we shall find ships whose good qualities are not only of high order, but are proved, and constantly under trial. Their freedom from accident to machinery and boilers is also under constant process of demonstration. It is estimated that with proper arrangements forty-eight hours would suffice to prepare one of these ships for war. When she would leave her moorings she would be in the most perfect order as regards steaming qualities, guaranteed by performances under regular service.

We have repeatedly expressed these views, and it is gratifying to find them in accord with those uttered by Rear Admiral Meade of the United States Navy at the meeting of the Society of Naval Architects at their recent meeting in this city. The admiral went so far as to express his doubts as to whether the Columbia is of higher fighting value than is the American liner New York. Until the Columbia is tried a dozen or more times over the ocean lane, her steaming powers will be largely problematical, and may safely be estimated well below her trial trip figures.

To maintain a war ship in the highest grade of efficiency, it would be necessary to keep her in constant service at high speed. This, too, would be useful for the crew. It would seem practicable to detail some war ships to mail service and to put them in competition with merchant vessels. The Columbia and St. Louis might try conclusions between New York and Southampton, and other ships might run to the Isthmus and to South American ports. Of course, if the mails were delayed by this course, it would not be an advisable one. But any such delay would go to prove the inferiority of our war ships, and none should be accepted as of the highest standard unless able to endure such tests.

THERE are nearly two thousand women practicing medicine in the United States.

Men of Genius.

Medicine is ill adapted to men of genius. One-sided brains find their vocation best in other callings. This is what we infer from the meaning now understood by the term genius, that is, where special intellectual faculties are developed to a phenomenal degree. Genius is said to be synonymous with degeneracy, i. e., to compensate for the exceptional qualities of certain parts of the brain there is necessarily a deficiency of others. A genius excels in certain attainments and is exceptionally dull in other respects. Talent has a very different meaning. It is the quality of a "level-headed" brain, and is, to a great extent, acquired, while genius is said to be spontaneous. Galileo, Edison, Darwin, Watts, Pasteur are said to be men of talent, while men of genius are Napoleon, Dr. Johnson, Charles Lamb, Handel, Sallust, Seneca, Byron, Wagner, Luther, and, according to Lombroso, most of the great men of history were not balanced mentally. Thus:

Bacon, philosopher—megalomania, moral anesthesia. Balzac, writer—marked epilepsy, megalomania. Cæsar, soldier, writer—epilepsy. Beethoven, musician—amnesia, melancholia. Cowper, writer—melancholia. Alexander the Great, soldier—alcoholism. Moliere, dramatist—epilepsy. Charles Lamb, writer—alcoholism, acute mania, melancholia. Mozart, musician—epilepsy, hallucination. Heine, writer—melancholia, spinal disease. Dr. Johnson, writer—chorea. Malibran—epilepsy. Newton, philosopher—amnesia. Ampere, mathematician—amnesia. Chopin, musician—melancholia. Coleridge, writer—alcoholism, morphinism. Mahomet, theologian—epilepsy. Handel, musician—epilepsy. Schiller, writer—epilepsy. Richelieu, statesman—epilepsy. Tasso, writer—alcoholism, melancholia. Savonarola, theologian—hallucinations. Luther, theologian—hallucinations. Schopenhauer, philosopher—melancholia, omniphobia. Napoleon, soldier—folie du doute, pseudo-epilepsy. Comte, philosopher—hallucinations. Pascal, philosopher—epilepsy. Renan, philosopher—folie du doute. Swift, writer—paresis. Socrates, philosopher—chorea. Schumann, musician—paresis. Shelley, writer—hallucinations. Bunyan, writer—hallucinations. Swedenborg, theologian—hallucinations. Loyola, theologian—hallucinations. J. S. Mill, writer—suicidal impulse. Linnæus, botanist—paresis.—The Omaha Clinic.

Eat Apples.

The Practitioner says apples have many good medicinal qualities. Chemically they are composed of vegetable fiber, albumen, sugar, gum, chlorophyl, malic acid, gallic acid, lime and much water. Furthermore, the German analysts say that the apple contains a larger percentage of phosphorus than any other fruit or vegetable. The phosphorus is admirably adapted to renewing the essential nervous matter of the brain and the spinal cord. It is perhaps, for the same reason, rudely understood, that old Scandinavian traditions represent the apple as the food of the gods, who, when they felt themselves to be growing feeble and infirm, resorted to this fruit, renewing their powers of mind and body.

The acids of the apple are of singular use for men of sedentary habits, whose livers are sluggish in action, those acids serving to eliminate from the body noxious matters, which, if retained, would make the brain heavy and dull, or bring about jaundice or skin eruptions and other allied troubles. Some such experience must have led to the custom of taking apple sauce with roast pork, rich goose, and other like dishes. The malic acid of ripe apples, either raw or cooked, will neutralize any excess of chalky matter engendered by eating too much meat.

It is also the fact that such fruits as the apple, the pear, and the plum, when taken ripe and without sugar, diminish acidity in the stomach rather than provoke it. Their vegetable sauces and juices are converted into alkaline carbonates by the chemical action of the stomach juices, which tend to counteract acidity.

Value of Coverings for Steam Pipes.

A certain test of steam pipe coverings leads to the conclusion that it costs $15.40 to run 100 feet of naked two inch pipe at from 70 to 80 pounds pressure for one year of 3,000 working hours, with coal at $2 per ton. With the least efficient of insulating coverings used in the test this loss could be reduced to $4, with the most efficient to $2.64. Striking as are these figures, they are probably below the cost of actual practice, for a steam pipe is under pressure usually more than ten hours a day, and $2 a ton is below the average cost of coal. Prof. Charles B. Gibson, in some tests for the Manufacturers' Mutual Insurance Company, some years since, reached the conclusion that with coal at $4 per ton and 3,000 working hours per year, the loss from a naked two inch pipe was 64½ cents per linear foot—considerably more than Mr. Dickinson's test would show even with coal at $4 per ton. However, the lowest of the estimates shows the importance of covering the pipes, and it is a good thing to attend to before the present loss is increased by the coming cold weather.—Power.

The Rights of Railways.

In an article on this subject the Railway Review says:

"The fact that railways have some rights which the public are bound to respect is a lesson that is sadly in need of being taught, particularly in this country at the present time. The average American citizen, even those that in every other respect are entitled to the designation of 'law abiding,' appears to think that he has a right to do pretty much as he pleases on the premises or with the property of a railway corporation, and any regulation enforced by the company looking to the assertion of its rights is usually denounced as an outrage, even though it may be for the better protection or convenience of the same complaining public. And yet, strange as it may seem, the same persons who display such an antipathy in this country to the restraint necessary to afford them protection, after visiting other countries, like England, for instance, where a trespasser on a railroad right-of-way is immediately arrested and severely punished, come back filled with admiration for the superior protection afforded in that country. Stranger still is the fact that many newspapers take up this same cry against the railroads and denounce in severest terms those corporations that seek to in anywise abridge the license of the American citizen to do as he pleases. Statistics show that a very large proportion of the personal accidents outside of train men that take place on the railways is chargeable to trespassing upon the right-of-way by persons who had no shadow of right to be there. Some facts in this connection were brought out in a paper read before the Western Railway Club, by Mr. F. A. Delano, in which the point is made that if even the laws we have in this country respecting such trespassers were adequately enforced, the percentage of such accidents would be greatly reduced.

"But more important even than the loss of life immediately resulting from trespassing upon railroad property is the recklessness and disregard of the ignorant and vicious classes in respect to interference with railway property in such a way as to produce train accidents growing out of, or at least greatly encouraged by, this prevailing sentiment. Switches are thrown, obstructions are piled upon the track, bridges are tampered with, trestles are rendered unsafe, and many other things are done which, if no accident happens, are scarcely noticed by the officers of the law, and even when accidents occur are not followed up with any degree of energy. Even in the case of train robberies the average officer of the law seems to consider it the business of the railroad to catch the thief, instead of, as is the case in England, using the whole machinery of the law to that end. As already stated, much of this recklessness and law breaking on the one side and indifference on the other is directly chargeable to the prevailing spirit among the people concerning the railroads. It is not intimated that railways are either beyond blame or exempt from it; but it is claimed that a higher regard for the rights of railroads should be cultivated, particularly in those lines that pertain to the welfare and safety of the community at large."

Mr. Delano said: I have in my individual capacity tried to see if the number of people killed on my own division of railway could not be reduced; and I have met all sorts of obstacles. It seems to be considered the right of every free-born American citizen to walk on the railroad track; and it is a fact that I can vouch for, that if you should arrest a man for walking along the railroad track, and could not prove that he had been robbing you or injuring your property in any way, any justice court in this city, probably in this State, would dismiss the man and lecture the railroad official for being so hard on a poor man. Recently some boys were caught by a watchman in the service of the C., B. & Q. stealing coal from a train of cars in transit. They were taken to a justice court. The justice fined them $50 and costs, then, relenting, he remitted the fine and told the boys not to do it again. After the boys got out of the court room they made gestures of contempt.

Even out in the country it is a well known fact that the railroad right-of-way is used as a short cut, a path from one place to another; and if you wanted to fence it up and then patrol it in such a way that no one could use the right-of-way for that purpose, you would meet a storm of public opinion at your little towns and country stations that you could not stand up against.

Another way in which a great many people are killed, and which seems to meet with popular approval, is the way people crowd on the freight trains, stealing rides. It is safe to say that there is not a freight train running that has not ten or a dozen people on, stealing rides; and in the cities in the morning and evening you will see the switching trains and the switching engines and the freight trains simply loaded down with working men and boys going to and from their work. Now it does not seem to be that the casualties arising from these practices ought to be laid at the door of the railroads themselves. It seems to me that there is want of education of the public at large.

During a short visit in England last spring I found that the reputation of American railways was that they were absolutely regardless of human life. In England they think that we do not care any more about killing a person than killing a sheep or a goat, and that seems to me something which this club should resent.

In looking over statistics of the number killed at grade crossings here in Chicago I was astonished to find that of the total number only 30 per cent, or less than one-third, were actually killed on grade crossings. Others were killed when trespassing on the right-of-way, or stealing rides on trains or walking along the tracks, or jumping on or off trains in motion, and yet the newspapers have made a howl about elevating the tracks, and state that all these people are killed on the deadly grade crossing. Personally, I believe thoroughly in separating the street grades from the railroad grades, but I do resent this tendency of saddling on the railroads and railroad managers of this country evils for which they are not responsible.

Quick Printing by the Aid of a Lens or Mirror.

It is only repeating the tritest of trite dicta when we say that the greater the intensity of light the quicker will the printing of a proof be effected. Our earliest experiment with the view of concentrating light was made on lines similar to those pursued with the idea of obtaining concentration of heat by the solar rays, viz., by the interposition of a crossed biconvex lens six inches in diameter. A number of trials were carefully made with two similar negatives, obtained in a stereoscopic camera and cut asunder. These were exposed in a printing frame, one being exposed to the direct beams of the sun without hindrance, while with the other the rays were concentrated by transmission through the lens alluded to, which was held at such a distance from the negative as just to suffice to illuminate the portion required for mounting. Several carte portraits vignetted were also tried at the time, and with a still more marked effect in abbreviating the exposure.

For vignette printing, concentration by a lens offers special advantages. The great artistic sin committed in the production of such prints, as we have so often pointed out, consists in printing the bust with the same or even greater force as the head, and then allowing the figure to merge with suddenness into the white ground; whereas by the lens the condensed circle of light need not be much greater than to embrace the head and neck for the primary or predominant printing, a slight subsidiary exposure being given to more of the figure by the simple expedient of slightly decreasing the distance between the lens and the negative. Very charming results are capable of being secured in this way; in fact, the lens may thus become a powerful artistic tool in the hands of any one possessing taste and art knowledge. Local effects, too, can be produced in a way quite incapable of being otherwise obtained, except by a tedious masking and working upon the negative.

Concerning the reduction in the time of exposure, we find that, when using the six inch lens spoken of, the time of printing is reduced to one-fourth that required without such an adjunct. In practice we obtained four good prints by the aid of the lens during the time one was secured without it.

But this was effected by the agency of what in these days of cheap and good glass must be considered as a lens of really no great diameter after all, viz., six inches. We have just repeated some of these comparative experiments with a fine reflector eighteen inches in diameter, procured for another purpose, and of short focus. Both surfaces are ground and polished, and it is silvered on the back. The amount of light reflected is very great, and when the sun's rays are brought to a focus upon a suitable vessel of water it causes it to boil very rapidly. The area of one is nine times that of the other, and the negative capable of being illuminated is proportionally greater. When we tried the great concentrating power of this reflector upon a small print, the paper was blackened ere we had got the companion printing frame properly placed in the window. The giant's power was there, but it was not properly controlled.

It need scarcely be said that no experienced printer would think of using such a power as that indicated, in season and out of season, as he knows that better prints are invariably obtained when the reduction of the silver in the printing paper is slowly effected; but there are many occasions on which a strong, quick light will be appreciated, and for such occasions we can strongly recommend the aid of a lens or a reflector. The best form of lens is a crossed one, although a plano-convex also answers. A crossed lens, it need scarcely be explained, is one in which both surfaces are convex, one being more so than the other, in the proportion, roughly, of one to six, the most convex side being turned toward the sun.

With a large lens, or a mirror, exceptional care must be taken not to allow anything to approach near to its focal point on account of the great heat engendered. The heating power of the solar rays depends upon the diameter of the lens by which they are condensed. Some idea of this may be had from the statistics of the burning glasses, which at one time were more in use than they are at present. That of Parker, of Fleet Street, e. g., with an aperture of thirty-two and a half inches, when its rays were concentrated by a second lens which reduced the focus to five feet three inches, and the image of the sun to half an inch, could melt twenty grains of silver in three seconds and ten grains of platinum in the same time. Bar iron and cast iron also succumbed after a nearly similar duration in the focus. The effect of such a degree of heat upon the negative paper if brought near to the focus may be conceived.—Br. Jour.

The Salting of Suicides in Old Forensic Medicine.

The embalming of human bodies is at present done by undertakers and there are few physicians, probably, who, if called upon to perform the operation, would be able to do so without consulting their books and reading up upon the subject. In olden times the case was different, and in France especially, before the Revolution, says a writer in the Revue Scientifique, medical men were frequently called upon to embalm cadavers, although the operation was applied almost wholly to one class of subjects, i. e., to suicides. But why were the cadavers of suicides embalmed, and what was the process used?

"Suicide," says Beccaria, "is an offense which it seems can be submitted to no punishment properly so called, since such punishment could be inflicted only upon an insensible or lifeless body, or upon innocent persons. Now, any punishment that might be meted out to the inanimate remains of the culprit would produce no other impression upon the spectators than that which they would experience in seeing a statue flogged."

And yet, according to the custom of Brittany, which was also general in France, if any one killed himself intentionally, he was hanged by the feet and then dragged like a murderer and his personal effects sold to whomsoever wished to purchase them. In some cases, he was tied face downward to a hurdle, dragged through the streets behind a dung cart driven by the public executioner, hanged for three hours by the feet from a gibbet erected in the public place, and then thrown into the sewer. It was also ordered that all remembrance of the deceased should be obliterated and suppressed forever.

But before any such proceeding took place, the cadaver was accorded a fair trial before a judge, whose duty it was to begin by making an official inquiry into the circumstances attending the act of suicide, the place where it occurred, the life and habits of the deceased, etc. This having been submitted to the King's procureur, the nearest of kin and the heirs of the suicide were summoned by trumpet to come forward and provide him with a defender. In case they failed to make their appearance, the judge appointed a counsel for him, whose duty it was to defend his client to the best of his ability by cross questioning the witnesses for the prosecution and offering all the excuses possible in extenuation of the offense. If the accused was found guilty, he was punished in the manner above described; but if he was adjudged innocent, that is to say, if the act of suicide was decided to have been committed in a moment of insanity, he was buried in consecrated ground.

In either case, however, it was necessary to preserve the cadaver for the entire length of the trial, which sometimes lasted for several months, so that in case the accused was found guilty he might not escape punishment. Hence the necessity of embalming, or "salting," as it was called.

It appears from the old records that the operation and materials used were as follows: The viscera of the cranial, thoracic and abdominal cavities were removed and the spaces stuffed with tow that had been soaked in a solution composed of one ounce of camphor, two ounces of Socotrine aloes and one gallon of alcohol. Deep incisions were then made in different parts of the body, and the latter was packed in salt in a wooden box, which, having been covered and nailed, was formally delivered to the jailer for safe keeping.

This method of preserving cadavers seems to have been successful except in a few instances in which the case against the accused, having been put upon the docket, was not reached for several years, and not disposed of until the offensive state of the remains called attention to the necessity of legal action in regard to them.

Professional Models.

The Photographic News proposes to induce a number of people, both male and female, big and little, to form an association of models, and, after sufficient training, to frequent the picturesque and other localities to which photographers are mostly attracted. On a stick over his shoulder the male would carry a bundle and the female a basket on her arm, each containing a number of inexpensive but suitable costumes, and, to prevent misunderstanding, a scale of fees might be arranged, varying, of course, according to the appearance or ability of the model.

THE FRENCH TRAVELING SCHOOLS.

From early in the spring to late in the fall there is a succession of fairs in the different parts of France, some of which, as the gingerbread fairs of Paris, are celebrated. These fairs somewhat resemble our American circus with its attending side shows. A large number of caravan wagons serve to carry the families of the owners of the booths from place to place, other wagons carry tents for performances of various kinds, and in addition to the sale of trinkets and eatables, the dime museum features are not forgotten. In many cases the fairs are held without the walls of the city or town, as then the eatables are not subjected to the municipal tax (octroi). In this nomadic kind of life the question of the education of the children of these people was a serious problem which was not solved until about three years ago, when Miss Bonnefois founded a traveling school for the children of the forains, as their parents are called. There are at present two of the schools for Paris and its immediate neighborhood. Huge caravan wagons are used. These wagons are eighteen feet long and ten feet wide. The light filters through the green linen sides, for the improvised schoolhouses have no windows. Blackboards, maps, and all the usual paraphernalia of the school room are provided. The children range from about eight to fourteen years and the hours of instruction are from eight to ten in the morning and from two to four in the afternoon. The schools follow a fixed itinerary from spring to fall, while in the winter they remain stationary. As the children would be apt to be transferred from one fair to another, the method of instruction in the schools is identical, so that a student may have a lesson in the school at Grenelle in the morning and recite his or her lesson at St. Denis in the afternoon. The parents of the children recognize the advantages of education and are disposed to help the schools as much as their very limited resources will permit. We are indebted to L'Illustration for our engravings.

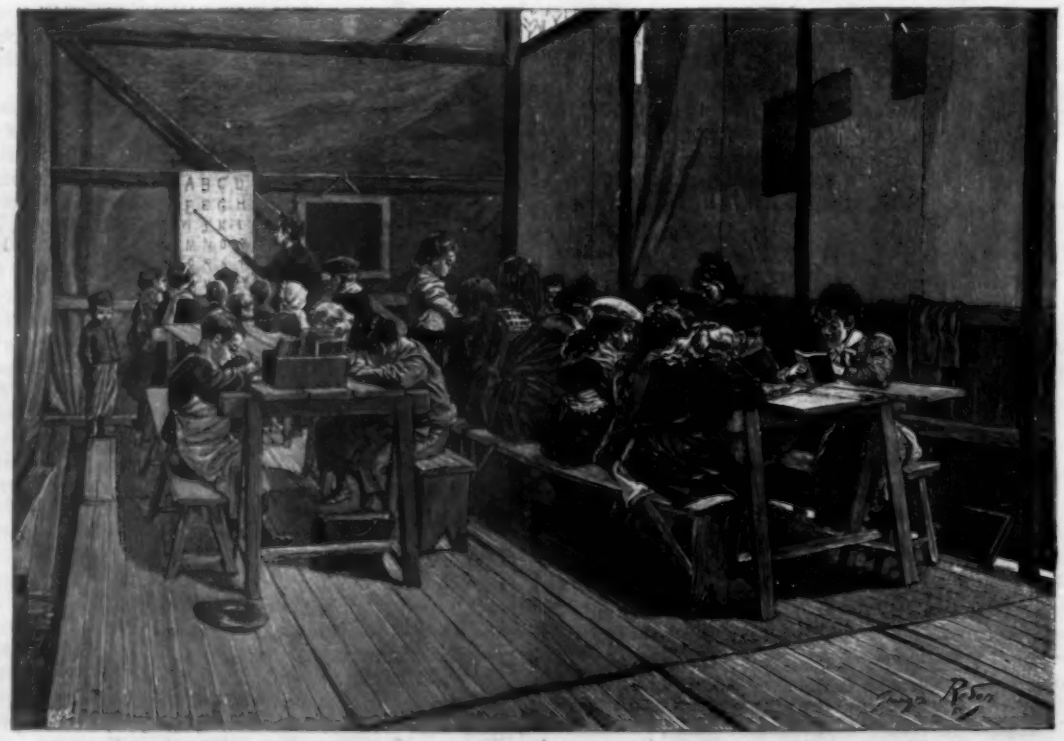
FRENCH TRAVELING SCHOOLS—EXTERIOR APPEARANCE.

The Chinese Army.

The well known Russian traveler Grum Grijmailo has described in a masterly manner, in the Historical Magazine, the typical characteristics of that part of the Chinese army the men of which are called "Yoons," or the bravest. Among his remarks are the following:

Chinese soldiers march anyhow. Their armament is in the highest degree varied; one has a rifle; a second, a sword; a third, both rifle and sword; a fourth, a spear; in fact, so diverse is their armament that it is impossible to describe the numerous variations. The non-commissioned officers possess revolvers and swords, but the officers are entirely unarmed. At first sight this seems remarkable, but one speedily becomes accustomed to this characteristic peculiarity of the Chinese army; the more so when one suddenly recollects that the greater number of Chinese officers receive no special training in the knowledge of their duties, and that scarcely a tenth part of them even know how to shoot. . . . This latter is still more remarkable, but is nevertheless a fact. Shooting with the bow, on horseback and on foot, fencing, and skill in carrying and hurling weights—such is the syllabus of the present imperial examination for the highest grades, that is for doctors of military science. As regards the lower grades, they are recruited from the defects of those parts of the army among which the greater part of their life has been passed. Various utterly senseless acrobatic feats (for instance, they turn somersaults, in order to deceive the enemy by a pretended wound, and simultaneously enable them to touch him with their long lance, or, still better, compel the feeble infantry to attack and deal blows with their exceptionally heavy and long spears), roaring to frighten the enemy, certain strange dances at stated intervals, in which unaimed fire is carried on, solely to create noise; in fact, even in the present day, the chief importance is attached to bows, pikes, and halberds.

Such are the chief elements of instruction of the army. The parades are characterized by the quantity of ornamental arms and frequent genuflexions. An immense number of glittering banners, the moans of the rebecks, the yells of the soldiers, their whimsical grimaces, or, on the other hand, their stealthily crawling toward an imaginary enemy, all this throws into ecstasies of delight the appointed military inspectors and corps commanders, who naively imagine that the whole range of military science is included in such childish folly. Besides, even such instruction as this is only given to the old militia. The Yoons receive no instruction at all. It is sufficient to glance at their rifles to be convinced how utterly helpless such troops would be against a well armed European adversary. The soldiers have no knowledge of cleaning and examining their rifles, and certainly carry out no instructions for their preservation. It is enough to say that the soldier does as he pleases with his breech-loading rifle; he shortens it by cutting off a piece from the breech or muzzle, uses it as a handspike, or by tying two rifles together forms a litter. The rifles of the Yoons are covered with rust; frequently the back and fore sights are broken off, for the western Chinaman does not understand their use, and finally their barrels are bent and in places indented. The Yoons despise the breech-loading rifles, they do not know how to handle them, and look upon the new importation with suspicion: "We knew how to shoot from the old rifles, but are afraid to from these," they frequently complain, and we must admit that their complaints are not unfounded. The armes blanches of the Yoons are perhaps worse than those of any wild negro tribe in the interior of Africa. If to all that has been said we add that the soldier continually exists in a half-famished state, the chronic diseases from which the greater number of men in each company suffer, and the moral enervation due to idleness and opium, it is not difficult to understand what a pitiable spectacle is presented by a detachment of such warriors.



FRENCH TRAVELING SCHOOLS—INTERIOR VIEW.

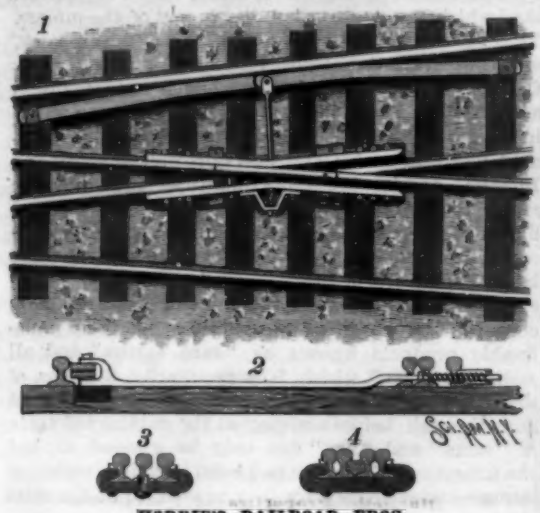
Magnetic Properties of Asbestos.

Mr. A. C. Swinton says: "In some recent experiments Mr. J. C. M. Stanton and I found that, employing a very strong electro-magnet, a piece of ordinary white asbestos millboard, about 4 × 3 × 1-16 inches in size, and weighing one-half ounce, was easily lifted through a vertical distance of one and one-half inches, and when in contact with the magnet pole the asbestos board would support four ounces in addition to its own weight. Lumps of hard asbestos, such as are used in gas fires, as also pieces of soft asbestos cotton packing, were also strongly attracted, and when some of the latter was placed on the magnet pole and the current turned on and off, the individual fibers could be seen in movement. Further, it is quite easy to permanently magnetize a piece of asbestos millboard, when it will behave exactly as a magnet both in attracting and repelling a compass needle. The principal constituents of asbestos are stated to be magnesia, silica and alumina, with some oxide of iron. No doubt it is to the presence of the last named substance that the magnetic qualities are due. White asbestos is, however, understood to contain but small traces of iron—much less than the colored varieties—and consequently the degree to which it is magnetic seems surprising. In any case it may be well to warn experimentalists that asbestos is not a suitable substance to employ in connection with delicate instruments where any unsuspected permanent magnetism might be productive of serious error."

ELECTRIC welding has been used to remedy blowholes in defective castings by first drilling out the defects and then heating the casting and introducing scraps of steel, which are melted by electricity, making a perfect joint without a seam or flaw of any kind.

AN IMPROVED SWING RAIL RAILROAD FROG.

The frog shown in the illustration is designed to dispense with the use of a base plate, but permits of the passage of locomotive and cars in either direction of travel from a side track to an intersected main track, automatically returning the swing rail of the frog to alignment with near rails of the main track after the cars have passed from one intersecting track to the other. The improvement has been patented by Mr. David Horrie, of Kakauna, Wis. Fig. 1 shows the improvement at the intersection of a side track with the

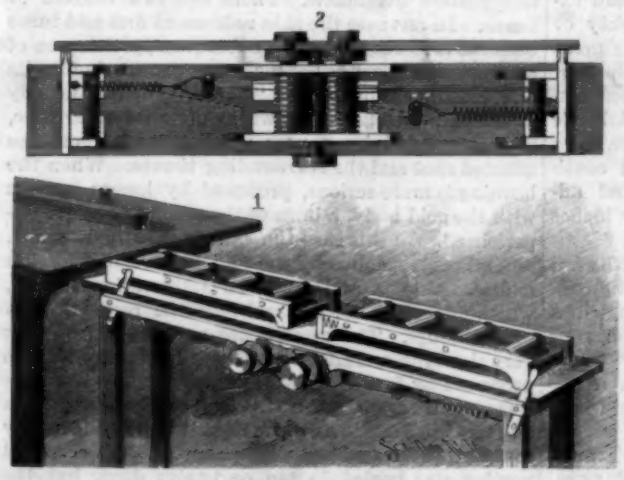


HORRIE'S RAILROAD FROG.

main track, the latter being continuous, Fig. 2 being a transverse sectional view on the line of the frog, and Figs. 3 and 4 being other cross sections. The frog consists of two inwardly bent carrier rails, with two plates clipped on their base flanges, and a swing rail pivoted near one end on one plate and slidable on the other plate. There are two transverse guide bolts fast in the carrier rails and loose in the swing rail, and a device to vibrate the latter, comprising tripping bars and a shifting rod, there being a bracket frame on one carrier rail and a spiral spring pressing the frame and spring rail. For further particulars relative to this improvement address the Northwestern Horrie Patent Frog Co., Antigo, Wis.

AN IMPROVED MECHANICAL CARRIER.

The mechanism shown in the illustration is designed to be of very simple and compact construction, and especially adapted for use in sawmills, or where boards or similar material may be thrown upon the rolls for transportation. The improvement has been patented by Mr. Charles P. Hogue, of Portland, Oregon. Fig. 1 shows the carrier in perspective, and Fig. 2 is a bottom plan view. On the bed, in suitable supporting frames, are transversely journaled rolls, whose upper surfaces project slightly above the tops of the frames, the rolls being grooved to receive a driving belt which connects with them all. On opposite sides are tension rolls or pulleys journaled in forks carried by springs, which serve to keep the belt taut. The rolls are all directly driven and turned in the same direction, and their direction may be instantly changed by moving a shift rail. The belt grooves are so arranged in the rolls that the rolls may be conveniently cased in and protected, and the driving drums connected with the rolls



HOGUE'S CARRIER.

may be used alternately as drivers and idlers, a single belt connecting the drums and every roll.

American Search Lights in the East.

An officer of the Japanese navy has written a letter to a friend in this country, in which he speaks highly of the efficiency of several American electric search lights used in the fleet to which he is attached. These lights stood the test of actual service better than the English and German apparatus, which will be doubtless condemned by a board of survey. He also states that the best maps of the Yellow Sea and Corea are from the United States Hydrographic Office in Washington. These maps and charts are compiled with the latest data, and the principal roads in Corea are clearly indicated.

Voting by Machinery.

The new amended Constitution of New York State makes it possible, says the New York Sun, to dispense with the ballot system of voting altogether and to substitute in its stead mechanical devices for recording the vote, if the Legislature shall so direct.

The amendment permitting the use of voting machines was inserted by the Constitutional Convention, which had in mind the successful trial of such a voting machine at several town and village elections in the western part of the State.

Mr. Jacob H. Myers is the inventor of this new device for registering votes, and has been trying for many years to get it used at elections. As the Constitution stood in the way, requiring as it did that elections be by ballot, it was found necessary to amend the fundamental law of the State before the machine could be used at all elections. This has now been done, and a description of Mr. Myers' mechanical device, which will become a part of the voting system of the State if the Legislature shall so direct, may be of interest to the voting citizens who may be called upon to use it.

To all outward appearance the machine is nothing more than a sheet iron box five feet square and seven feet high. It has two doors in the front, one for the entrance of the voter and the other for his exit after he has registered a freeman's will. On entering the box the voter finds himself fully inclosed from prying eyes, for there is a roof over the booth, which is lighted from within. At the back of the booth the voter sees several rows of knobs in parallel perpendicular rows occupying almost the entire back wall. Each of these rows is reserved to the candidates of a particular party who are to be voted for. The party designation will be found at the top of each row of knobs, and opposite each knob will be found the name of the candidate to be voted for. If the voter cannot read, he can recognize his party candidates by the distinctive color of the paper on which the names are printed. Provision is made for the strict party man who wants to vote the straight ticket, which is the easiest thing to do in the Myers voting machine, as it is by any mode of voting yet devised. By pulling a lever at the top of a column of knobs one vote is cast for every candidate of the party. At the same time all the other levers and the knobs are locked, and if the voter should remain in the box all day he couldn't cast another vote.

The machine would be the delight of the Mugwump He could pick out individual candidates nominated by all parties and split his ticket to his heart's content. In voting for individual candidates the pressing in of the knob opposite the name of the candidate (for mayor, for instance) would lock the knobs of every every other candidate for mayor, so that there would be no danger of anybody's voting twice for mayor.

When the voter leaves the booth by the "exit" door all of the levers and knobs are released by the action of the door, and the booth is ready for another voter. There has been some talk to the effect that the voter might be confused by a multiplicity of candidates, but the provision of the Constitution separating State and national elections from those for municipal officers has disposed of that adverse argument.

Outside the booth the voter will find a chart representing the position of the knobs and their relation to the candidates, which will assist him very materially in recording his desires when he gets inside. Similar charts can be used by the political poll workers in instructing their friends. Only a blind man would be incapable of voting with the machine, but he might have assistance, the law so providing.

In an actual village election, where it is true there were only a few candidates in the field, more than one thousand votes have been registered by a single machine, and the inventor claims for it a capacity which would permit of greatly reducing the number of election districts in this city, were it used here, thus greatly lessening the expense of elections.

So much for the voter's part. The machine does the rest. Back of those long rows of levers and knobs is a shallow box fitted into the back of the booth, which contains the counting machinery, which is worked when the levers are pulled or the knobs pushed by the voters. This automatic counting arrangement is similar to that of the automatic cash registers; or a better comparison, perhaps, would be the counting machines which register the number of newspapers run off by a printing press, or the fare registers on a street car.

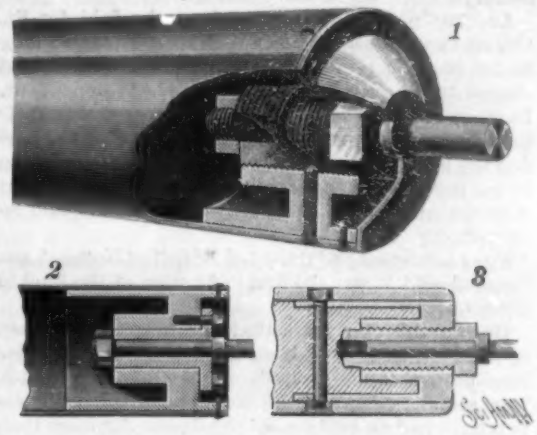
This counting machinery is protected by a door which cannot be opened except by the inspectors of election after the voting is done, and then the canvass of the vote is practically completed. The exact vote cast for every candidate will be indicated by the machines. Should the tally of voters who entered the booth kept by the election inspectors and poll clerks not agree with the machine, the conclusion would be that fallible man was mistaken, and that the machine's record was accurate.

Inventor Myers says that two votes a minute can be cast by the use of his machine. Provision is made for independent candidates for single offices, who have been properly nominated, and each will have his separate knob. Not to deprive the discontented voter of his right to vote for whom he pleases, whether nominated or not, provision will be made for the reception of such ballots and their deposit in a box outside of the booth.

As to the cost of the machines, they are estimated to be worth $250 apiece. This city would certainly need 1,000, if not more. On the other hand, the saving through their use would be more than $100,000 a year, as indicated by the estimate of the Bureau of Elections of the cost of elections under the present system. In the first place, ballot and poll clerks might be done away with. They are to be paid $57,000 this year. A doorkeeper for each machine might be required in their place, however. The printing of the ballots this year cost $40,000, and there was $5,000 expended in fitting up polling places, which would not be needed with the machines. Added to this would be the saving consequent on a very considerable diminution in the number of polling places, which it is believed would be rendered possible by the introduction of the voting machine.

AN IMPROVED JOURNAL HEAD FOR ROLLS.

This is an improvement in rolls, cylinders, etc., primarily designed to facilitate paper making, providing therefor a journal head of simple and durable construction, easily applied, and permitting of convenient-



McCORKINDALE'S JOURNAL HEAD FOR ROLLS.

ly removing and replacing the spindle in case of wear or breakage, without removing the roll from the machine. The improvement has been patented by Mr. Duncan L. McCorkindale, of Childs, Md. Fig. 1 shows the application of the improvement, with the cylinder partly broken away to show its interior supports, Figs. 2 and 3 being modified forms of journal head bearings. As shown in Fig. 1, a head riveted inside the cylinder end has a hub with an interior screw thread in which screws a bushing with polygonal head, the journal spindle being carried by the bushing. The rear end of the journal spindle is screw-threaded, and receives a nut to fasten the spindle in place in the bushing. The spindle is fastened in place in the hub of the head by a set screw. It will be seen that with either form of the improvement the journal head may be readily applied or removed without removing the roll from the machine.

Extensive Trolley System.

A franchise for the construction of an electric railroad in the town of Milton and the village of Ballston Spa, N. Y., has been awarded to the Boston Electrical Construction Company. Work will be begun at once, so that the road will be in running order August 1, 1895. If the ideas of the company are finally carried out, there will be a belt line running from Ballston Spa to Rock City Falls, thence to Jamesville, easterly to Greenfield Center and Saratoga Springs, and thence south to Ballston Spa.

The road will be of the standard gauge and will run ordinary freight cars direct from the large paper mills at Rock City Falls to New York City without breaking bulk. It will also have passenger equipments. The new road, its projectors claim, will be the beginning of a system of electric roads connecting Troy, Albany, Schenectady, Amsterdam, Broadalbin, Johnstown, Gloversville, Rock City Falls, Saratoga, Ballston, Mechanicsville, and possibly other cities or villages.

The Care of Epileptics.

In connection with St. Clement's Hospital for Epileptics, Twentieth and Cherry Streets, Philadelphia, the Ledger says, the board of managers are at present taking active steps toward providing a farm for their patients, a plan which has been successfully tried abroad and in many States of this country. One of the most necessary conditions for the successful treatment of epileptic patients is the provision of occupation and interest for them, and this condition is by all odds best brought about by the outdoor life and exercise of the farm.

With a farm in connection with the hospital, the hospital itself would act mainly as a receiving ward for the farm. The patients would be treated at the hospital, and, if their recovery were possible in a short time, they could remain there. But the great majority of cases are only improved by long treatment, and for these the farm will be an exceedingly necessary factor.

Toward this plan $15,000 has been promised by a prominent philanthropist, and farms have been viewed in the neighborhood of the city with the intention of purchasing. Another prominent citizen has promised, on condition of the purchase, $5,000 toward the erection of suitable buildings.

Just now, however, the plans of the board of managers have been slightly retarded by the death of one of the benefactors of the institution, but it is hoped that the work will speedily go on.

Contrary to the general idea, in one-third of the cases of epilepsy the patient is in possession of his full mental power. It is cited as proof of this fact that Napoleon, Cæsar and Petrarch were afflicted with this disease. A great many of these patients are capable of earning their own living, were it not for the fact that the disease impresses every one as being a horrible affliction. When left to brood over his condition, the epileptic is often seized with melancholia, and he is driven to the hospitals for the insane, where he becomes insane from his surroundings.

Another point which determined the field for St. Clement's work was the fact that an epileptic, so long as he remains at home, is a constant burden and charge to the relatives upon whom he is dependent. In many cases the relatives are so hampered that their business is interfered with, so that in relieving the burden the hospital would not only alleviate the suffering of one person, as is the case with ordinary patients, but it would also relieve the family of great care and responsibility.

For such reasons as these the Epileptic Hospital was founded, and it was the first institution of the kind in the country.

During the two years that the hospital has been open 51 patients have been admitted. Two of these have been absolutely cured, one of whom had from 20 to 30 attacks a day and the other two or three. These two have had no evidence of the disease for more than a year. All the rest have been decidedly improved, with the exception of three who died from intercurrent troubles.

Although the hospital was the first to take up the work, it has fallen much behind of late, because of the lack of proper facilities, the most important of which is the farm. In New York, Ohio and Maryland institutions of this kind have been provided with this necessary outfit, and Virginia and other States are taking steps in this direction. Europe is far in advance of this country in the care of these patients. In Germany, Holland, France and England colony farms have been established for these people. In Germany they have a regular town, which was started by a minister. Schools, churches and the departments of the town government are conducted by the epileptics, who are happy in their occupation and in being away from the observation of those not similarly afflicted.

On the proposed farm the character of the work for the men will be light trucking, gardening, the care of the buildings, the making of brushes, etc., and in fact the manufacture of any articles where dangerous machinery is not used. For the women there will be the duties of housekeeping, needlework, and the making of fancy articles. The patients will thus in a measure become self-supporting.

Many can hold subordinate positions about the farm, making them recognize their own importance, and preventing lapses to the despondent moods which are so dangerous.

Academy of Natural Sciences, Philadelphia.

At the last meeting Dr. S. G. Dixon made an important communication, based on his work in the bacteriological laboratory of the Academy, on the curative and protective influence of certain materials in tuberculosis. His former researches on tuberculine were reviewed, and the results obtained by the injection of creatine, taurine, and other agents of the amide group were dwelt on. The results were such as to decidedly encourage further researches in the same line, the deductions being based on the fact that gouty and tuberculous conditions are rarely found united in the same patient, and that the production of the conditions present in superabundant degree in gout will render the system immune to the encroachment of the graver disease. A case of lupus treated on this theory had, he believed, resulted in cure.

Prof. Ryder spoke of his studies of the spinal cord in certain embryo birds, where, in the lumbar region, a cushion-like mass of tissue, consisting of loose spindle-shaped cells, is interposed between the lateral columns. He had found no such opening in the posterior part of the cord as had been described by Foster and Balfour. The structure was found in the young bird only when it was ready to be hatched, not earlier. In some birds, as the ostrich, there is a manifest enlargement of the vertebral column in the lumbar region, which may be occupied by the tissue described. Prof. Marsh had suggested that such enlargement might indicate the presence of a lumbar brain.

Prof. Cope stated that the greater part of the cranial cavity in reptiles is occupied by fat and connective tissue, in which the brain is embedded. The lumbar expansion in certain extinct reptiles may be occupied in the same way, although Prof. Ryder's explanation might be correct.

Referring to an unusually large specimen of the remora, or sucker fish, on the table, Prof. Ryder remarked that when the species is kept in an aquarium the gills can be observed to move rapidly, as if the fish were in need of a more liberal supply of oxygenated water, but when it attaches itself by its sucker to another fish and is thereby rapidly drawn through the water, such evidence of distress is not perceived.

Mr. Lewis Woolman exhibited specimens of sea actinia recently thrown up on the beach at Wildwood, N. J., in large numbers.

Prof. Cope presented for publication a paper on the reptiles and batrachia collected by a zoological expedition sent by the University of Pennsylvania to the West Indies in 1890 and 1891. The zoologist of the expedition was Mr. J. Percy Moore. To his care we are indebted for an excellent series of the vertebrata of the islands visited. The collections from Crooked Island and Inagua are specially important, as but little was previously known of their vertebrate fauna. Six of the forms had not been before described.

The Hudson River.

The Hudson River, as we call it, along the western shore of the island of Manhattan, is now a majestic estuary rather than a river, and is deep enough for all the uses of great ships. But its present bottom is formed of the rock wreckage of an earlier day, which has largely filled up a chasm once several hundred feet deep, through which the old river ran.

So colossal was the sheet of ice which came sweeping down from the northwest over the top of the Palisades in the ice age that this ancient chasm of the Hudson River—a veritable canyon once—changed its course no whit. For the direction of the grooves and scratches seen everywhere on the exposed surface of the Palisades, and pointing obliquely across the river's course, run in the same direction as do those on the rocks over which the city stands.

It not infrequently happens that steamers and ships bound for New York, when not quite certain of their whereabouts as they approach the coast, are compelled to seek what help they can by consulting the nearest land, which under these conditions is the sea bottom. The sea bottom along our coast has been so often and so carefully "felt" that we know a great plateau extends out beyond the coast line for some eighty or ninety miles, where it suddenly falls off into the great depths of the Atlantic. The place on which New York stands was, it is believed, once much higher than it is now, and was separated from the North Atlantic border by some eighty or ninety miles of low sea coast land, now submerged, and forming this great continental plateau. Indeed, the New Jersey and adjacent coast is still sinking at the rate of a few inches in a century.

For us to-day the Hudson River ends southward where it enters New York harbor. But a channel, starting ten miles southeast of Sandy Hook, and in a general way continuing the line of the Hudson, runs across the submerged continental plateau, where finally, after widening and deepening to form a tremendous submarine chasm, it abruptly ends where the plateau falls off into the deep sea.

This chasm, near the end of the submerged channel, is, if we may believe the story of the plummet, twenty-five miles long, a mile and a quarter wide, and in places 2,000 feet in vertical depth below its submerged edges, themselves far beneath the ocean's surface.

This "drowned river" is probably the old channel of what we call the Hudson River, along which a part of the melting glacier sent its flood during and at the close of the age of ice.

And so at last—rounded and smoothed rock surfaces, where once sharp crags towered aloft; glacial grooves and scratches on every hand; erratic bowlders, great and small, cumbering the ground; a typical rocking stone delicately poised by vanished forces long ago; a terminal moraine so great that it forms picturesque landscape features visible many miles away—these are some of the records of the great ice age which one may spell out in a holiday stroll about New York.—Harper's Magazine.

Monazite.

Monazite is a strange, rare mineral found in that rich metallic heart of the Appalachian Mountains that lie in North Carolina. Some year or so ago, one of the gold mining companies down there discovered in their placers a deposit of small, brown crystalline sand which was quite unfamiliar to any of the miners. They sent a sample to their agent here in New York, says the N. Y. Sun. Theagent sent it to a famous German analytical chemist, by whom it was recognized as monazite. Up to that time it had only been found in small and scattered deposits in such widely separated localities as Finland and Cornwall, Norway and Bohemia, and in such small quantities that only the richer laboratories had any specimens. It was not like anything else under the sun, and so the few brown octahedron crystals that had been bottled up were labeled monazite, or the "lonely" or "solitary" mineral. The composition of the mineral was even more curious, for it was found to contain six of those undefinable products known as "rare earths" and all ending in "ium," which is a peculiarity, it seems, of these imperishable dusts. What these dusts had gone through before arriving at the catalogued state of "iums" and "ites" can only be guessed at, but the inference is that they had been born in a period of intense cosmic energy, for they proved to be the most "refractory" things on record.

Chemists call things refractory when they can neither melt nor burn them back any further toward the point of elementary origin, and these earths wouldn't go back at all. No matter how great the heat, they just became incandescent, and glowed with a brightness that was like that of the sun; but when the flame was turned off they were just rare earths, undestroyed "iums" as before.

It happened about this time that a certain illuminating company was looking for just such a material as monazite, and in correspondence heard of it. Investigations were made, experts were dispatched to North Carolina, and monazite was found by the ton. Along the river banks and in the river beds, in the clefts of auriferous rocks, and at the bottom of gullies the brown crystalline sand was found, and bought and shipped to Germany. But it took a lot of sand to furnish the imperishable material in the shape that was needed, and the price went up until it reached $150 a ton, and from that up to $200 and over. Then the search for monazite was begun in earnest, and now in Alexander, Madison, Mitchell, Yancey, Burke, Polk, McDowell and Rutherford Counties there is a monazite boom.

Cold that Burns.

Burning is usually associated with heat, and it seems a misnomer to speak of cold burns. Chemists tell us that there is really no such thing as cold, which is relative heat, and that the lowest temperature yet registered is some degrees above absolute cold.

At the last meeting of the Swiss Society of Natural Sciences at Lausanne, M. Raoul Pictet gave some particulars concerning cold burns experienced by himself and assistants during his investigations of the lowest temperature attainable. There are two degrees of burns. In one case the skin reddens at first and turns blue the following day, and subsequently the area of the spot expands until it becomes nearly double its original dimensions. The "burn," which is usually not healed until five or six weeks after its occurrence, is accompanied by a very painful itching on the affected spot and the surrounding tissues. When the burning is more serious, produced by longer contact with the cold body, a burn of the second degree is experienced. In this case the skin is rapidly detached, and all parts reached by the cold behave like foreign bodies. A long and stubborn suppuration sets in, which does not seem to accelerate the reconstitution of the tissues. The wounds are malignant, and scar very slowly in a manner entirely different from burns produced by fire.

On one occasion, when M. Pictet was suffering from a severe burn due to a drop of liquid air, he accidentally scorched the same hand very seriously. The scorched portion was healed in ten or twelve days, but the wound produced by the cold burn was open for upward of six months. In order to try the effect of radiation in dry cold air, M. Pictet held his bare arm up to the elbow in a refrigerating vessel maintained at 105°, when a sensation of a peculiarly distinct character was felt over the whole skin and throughout the muscles. At first this sensation was not disagreeable, but gradually it became decidedly so, and after three or four minutes the skin turned blue and the pain became more intense and deep seated. On withdrawing the arm from the refrigerator at the end of ten minutes a strong reaction was experienced, accompanied by a superficial inflammation of the skin.—Newcastle Chronicle.

THE COLUMBIA TELEPHONE SYSTEM—ITS FACTORY AND INSTRUMENTS.

When the Bell patents expired, the field of telephony was opened to the public. The famous undulatory current ceased to be an element in the finances of the world. But during the terms of the patents a practical monopoly, based on the extensive plants of the Bell Telephone Company, had been created. However open the field, it would now be very difficult for an opposition company to begin operations in any of our large cities. But in minor and local installations there is ample ground for the telephone. Owing to the system of fixed annual rentals established by the present corporation, the telephone has not begun to fill the role that it should. In the system of the Columbia Telephone Manufacturing Company, we find exactly what seems to be needed at the present time. It is a system applicable for twenty or thirty separate stations worked by a simple switch system, and so arranged as to be practically automatic. It is sold outright to customers, there being no annual tax for its use.

In our cuts the exterior of the factory is shown in Fig. 1, while Fig. 2 shows the woodworking shop, where all the cabinet work is executed. Fig. 3 is the machine shop and electrical department. Here all the parts are assembled, and the instruments are turned out complete and ready for use. Fig. 4 gives a view of the foundry, where brass and iron castings are made.

In the very complete factory which we have described are made complete telephone outfits, with a most sensitive microphone transmitter and a receiver of improved shape and qualities. These we shall next describe.

The transmitter is a multiple contact microphone, comprising several little carbon cylinders, held parallel and in a horizontal position between two blocks of carbon. A wooden diaphragm is clamped across the mouthpiece of the instrument directly in front of the carbons. The receiver is a magneto-telephone with special steel magnets and ferrotype metal diaphragm. The case of the telephone is of improved shape, making it much more convenient than is the ordinary instrument of more familiar shape. As call, a magneto bell is sometimes used. In the upper part of the cut are shown various types of the apparatus, including a plug switchboard.

One peculiar feature is to be noticed. The receiver when not in use is hung on a hook. Immediately above the hook is the knob or handle of a switch. To remove the receiver this has to be turned to one side. At once buzzers begin at both stations to sound and continue until the switch is turned back. Thus the telephone is removed and the buzzer sounds until the distant party removes his telephone and answers. Then when one telephone is replaced, the buzzer continues to sound until the other is in place also with its switch turned back. This arrangement dispenses with the magneto call bell and the gravity switch.

In Fig. 5 is shown a complete outfit for one station. At one side is the upright standard supporting the transmitter on its top and with the receiver hung from it. On the table is the switch with its various connections. This shows the simplicity of apparatus designed for perfect efficiency for a limited number of stations. Such an outfit is termed the warehouse system as applicable to large buildings where many people may have to be under call.

In the lower part of the cut are shown some interesting examples of early telephones constructed by James W. MacDonough, a pioneer inventor in this line of work. A metallic diaphragm carbon transmitter is illustrated in the cut marked A. This dates back to September, 1875. This instrument was designed to be held in the hand. A point bears against a German silver plate carried by a tightly stretched diaphragm. Various materials were tried for the point, among others a lead from a pencil, thus producing a carbon microphone, and one which transmitted speech perfectly. B shows the receiver used with the above transmitter in 1875. It is a horseshoe magneto receiver, and with the carbon transmitter constitutes a complete telephone system. The sketch marked C illustrates a pendulum receiver made in 1875, which was also a carbon point microphone. D is a combined instrument. The diaphragm acted as an element of a microphone, contact points being operated by it, and it also acted as the vibrating diaphragm of a receiver, a plate of iron being attached to it and an electro-magnet being placed beneath it. In E and F are seen other forms of transmitter and receiver, their construction being evident. These date back to April, 1875.

MacDonough is still living. He was led to experiment on the telephone by the study of the early work of Reis. There is little doubt that he is among the very first to have produced a speaking instrument, if not the earliest, for whatever has been done with the Reis instruments, there is no positive record that the old German inventor ever succeeded in getting articulate speech from his transmitters.

The work of the Columbia Company in exploiting this particular field of work is most interesting and makes it an appropriate inheritor of the work of MacDonough, for unquestionably a microphone system for strictly local work, and sold outright to the customer, is something which has long been a desideratum, unsupplied by existing companies.

They also furnish microphone instruments for exchanges and magneto transmitters of special construction.

The instruments and system can be inspected at the offices of the company, 136 to 140 Front Street, New York City.

Lightning Conductors.

Writing in the Engineering Magazine on the subject of lightning and lightning conductors, Dr. Oliver J. Lodge remarks that the theory of lightning rods consisted in the idea, which originated with Franklin, of a charged cloud as a reservoir of electricity which desires to come down to earth, and the consequent belief that all that is necessary, in order to enable this to be done, is to provide the electricity with an easy path—to wit, a rod of good conducting material. Whenever this arrangement failed to act in the way expected of it, wherever a side flash sprang from it to other and apparently inferior conductors, wherever gas was ignited by apparently quite detached and unstruck conductors, it was customary to abuse the lightning rod as badly erected or imperfectly tested. The "earth" came in usually for the larger share of blame; but it is now known that in no case can a defective earth be held accountable for the whole of the mischief. The truth, as it is now understood, is that lightning is an oscillatory discharge of enormous energy, which no copper rod, however thick and long, can really dispose of harmlessly. Experimentally, it can be shown that when a lightning discharge takes place, even down such a rod as this, sparks may fly from it to all conductors near, capable of setting fire to any explosive compound or gas leak which they may chance to encounter. Practically, Dr. Lodge recommends for the protection of ordinary buildings the placing of a wire along all the gables, and down all the corners, with perhaps a few in between along any prominent features, so as to inclose the building in a sort of wire network. Any metal serves equally well for the conductor; conductivity being unimportant in comparison with durability. Points or projections to the sky are useful to take the violence of the direct flash at its point of incidence in a cheap and conspicuous manner. Earth connections are desirable to save the foundation, the soil, and the pipes therein from being damaged. After receiving a flash, all cellars and places likely to contain gas pipes should be inspected. Nor should a custodian of an important building rest secure until a sufficient lapse of time has rendered it unlikely that any minute ignition may be gaining headway in some obscure or inaccessible region. Plenty of iron wire instead of a single copper rod seems to summarize Dr. Lodge's prescription for the protection of ordinary buildings. For lofty chimneys, however, he suggests in addition throwing the conductor across the opening of the shaft.

How to Move Large Maples.

To a correspondent who asked how to move and prune some large maple trees, six or seven inches in diameter, the editor of Garden and Forest replies: In removing trees the roots are generally injured to a greater or less extent, and those which are bruised must be cut away; it is good practice to prune in the branches to a corresponding extent, so that there will be not more leaves than the roots can supply. Norway maples of the size indicated cannot be removed without the loss of many roots, and pruning will be necessary. Such pruning will be perfectly safe, as these maples are not injured more than any other trees by this operation. A great deal of this pruning can be effected by thinning out the inner branches, but there should be no hesitation about cutting back limbs where this seems necessary. When the ends of the branches are pruned they should be cut back to a limb, the wounds should be covered with coal tar, and no stubs should be left to decay. In removing such large trees it is good practice to prune the roots back by digging a trench about the trees, say five feet from the trunk, and if this trench is filled with good soil new feeding roots will start out during the next year, so that the tree will be in excellent condition for removing in a year from the coming winter. Large trees can be removed with success, but it costs time and care and money. Persons who do not choose to go to the extra expense, however, can console themselves with the reflection that, as a rule, it is best to plant small trees, and that a tree ten or twelve feet high will probably be as large in ten years as one planted at the same time when it was twenty-five feet high.

IN Switzerland a milkmaid or man gets better wages if gifted with a good voice, because it has been discovered that a cow will yield one-fifth more milk if soothed during the process of milking by a pleasing melody.

Correspondence.

Cicada Hut Builders.

To the Editor of the SCIENTIFIC AMERICAN.

Mr. Krom, in his letter in your journal of November 10, has placed a wrong construction upon a statement in my article published in the issue of October 13. He seems to think I meant that the cicada structures were built by the pupæ to live in, as a protection from the unseasonable heat.

Not so; but rather that after opening their shallow burrows, in thin soil, when revived by the early warmth, they roofed them over; impelled by an instinctive impulse to protect themselves in some measure from the heat that would too soon develop them. Many cases of equal intelligence among insects could be cited. It seems a rather giddy flight of the imagination to suppose that I, or any one, could think they would seek a sun-baked dome on the surface for a refuge, instead of the cooler depths of their shafts.

I have abundant evidence that the huts were built in March; the hottest March as far back as the records of the weather station at New York extend—to 1870. (I inadvertently wrote April in my article.) And it was even hotter at Nyack, where most of the large aggregations of huts were found, the temperature rising to 70 degrees in the shade, bringing out the wild flowers a month ahead of their season. Even as far up as Poughkeepsie it rose to 71 degrees, north exposure.

Several large hut areas were visited by me on top of the Nyack hills and the Palisades, aggregating over one hundred acres; one of them certainly over sixty acres in extent. All of these were in shallow earth, over smooth, glacial-worn rocks.

Of course in other localities, where underlying rocks were more or less broken, fissured and uneven, some of the pupæ could descend deeper, and open holes might occur later among the huts. Even single ones might appear where undeveloped pupæ should happen to be near the surface, and so feel the vivifying warmth.

Mr. Krom's theory that the pupæ build the structures in order to receive heat will hardly do, since they could get all they wanted without going to that trouble by simply remaining at, or just below, the mouths of their burrows. I have seen very many peering from their holes. Insects, unlike the genus homo, do not waste their time in unnecessary labor.

There is almost positive proof that the building instinct is inherent with all of these insects, called out as occasion requires. The theory that the high ground builders were the progeny of those which had formerly built on low ground, subject to overflow, will hardly hold, since the few, if any, that might reach the elevations would be widely separated. It is illogical to suppose that the possessors of this alleged hereditary trait would all keep together; congregating in populous groups, and erecting their domed roofs by the million, in contiguity, separate from those which would later emerge from unroofed shafts. Why should they select shallow earth, either over rocks, or over sandy soil, too incoherent for burrowing, as in one case reported to me, just where the abnormal heat of March would sooner revive them? Why did those in low ground, subject to overflow, among the deep ground hollows of the hills and on the flats, build no huts? In such places countless open holes were observed.

The fact is, that in former years these structures have been exceedingly rare, and almost any guess as to their purpose would do. But in this year they have been found in vast numbers under the exact conditions of early high temperature and environment that would revive their builders in an undeveloped state, lending extreme probability to the early heat and shallow burrow theory. BENJAMIN LANDER.

Nyack, N. Y., November 12, 1894.

How the Cat Falls.

A select company of the savants of Paris has been endeavoring to determine why it is that when a cat has to execute a fall it invariably falls upon its feet. To this end the society has subjected a subject to a series of falls from a height of some eight-and-forty inches. The drops have been made as awkward for the animal as science knew how, but the result has always been the same. In the course of its brief descent Grimalkin has always contrived a means to land neatly on all fours, with its tail at a triumphant right angle. How does it do it? The cat's determination to keep its secret has baffled the closest inquiry. No less than sixty instantaneous photographs have been taken of as many phases of the chute. At a convenient distance from the finish the cat is seen revolving in itself, without any visible assisting force, and stopping in its revolution when it has got right side uppermost. And all science can do is to abuse the cat for violating the laws of nature. The explanation of the phenomenon would seem to be that pussy knows better how to fall than the laws of nature could teach the scientist.—Pall Mall Gazette.

THE LAUNCH OF THE ST. LOUIS OF THE AMERICAN LINE.

In a recent issue of the SCIENTIFIC AMERICAN (August 11, 1894), we described and illustrated the steamship St. Louis, of the American Line, under process of construction by the Cramp Company, of Philadelphia. Embodying American ideas, and built under the strongest incentives afforded by international rivalry, there is little doubt that the St. Louis and its sister ship will surpass anything of their size afloat.

We reproduce in this issue the scene at the launching, which took place on November 12, when the great ship, in the presence of a vast throng, amid cheers and the booming of cannon, slid down the ways into the Delaware River, christened by Mrs. Cleveland, who broke over its bows a bottle of American champagne. It is estimated that from forty thousand to fifty thousand people were present.

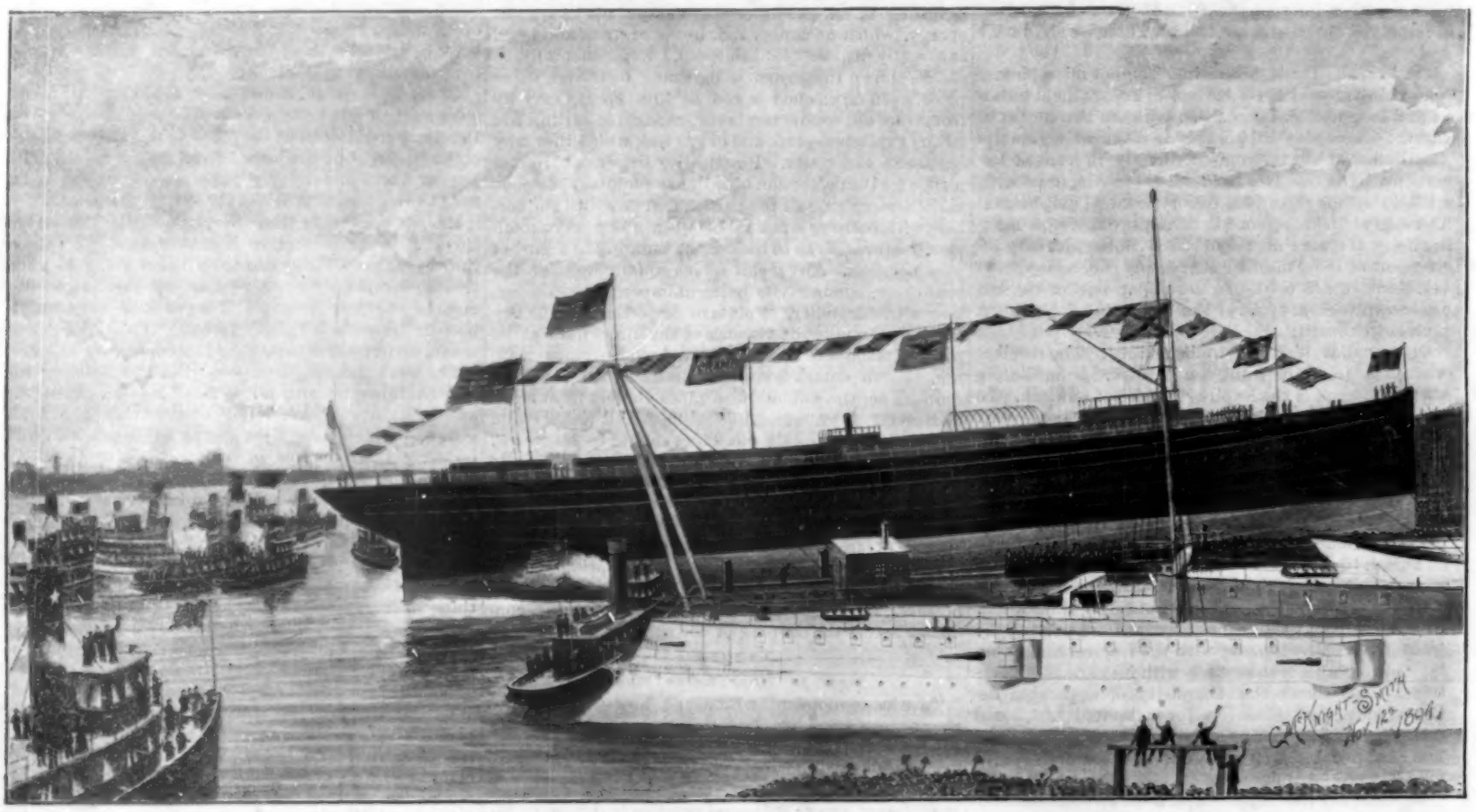
The ship as it stood on the ways was red below the water line and black above it, and was decorated with flags in great variety. Nearly 500 workmen drove the wedges; the upper ways were sawed through, and at about 1 P. M. the ship took the water. The pitch of the ways was $\frac{1}{4}$ inch to the foot, and the hull as launched weighed over 9,000 tons. There was a collation served after the launch to nearly two thousand guests, including the President and many others of note in the political and naval worlds.

Early in the seventies four transatlantic steamers of the State Line were launched at Cramps' yard. Now, after some twenty years interval another one is put into the water, and in the spring the St. Paul, the sister ship, will be launched.

Construction was begun on the St. Louis July 27, 1893. She is to accommodate over 1,300 passengers and a crew of nearly 400 officers, sailors, engineers, firemen, etc. She must show over twenty knots sea speed, according to the post office contract with her owners. One of her details alone is enough to indicate what a complex affair the modern steamship has become, for besides her main engine there are forty-nine auxiliary engines for every conceivable purpose. The bulkheads are so distributed that it is believed that the ship is practically unsinkable.

In size and engine power the new ships will come between the Campania or Lucania and the Teutonic or Majestic. It is hoped that the St. Louis will be in service next June. Expectancy regarding her performance will run very high.

Our view shows in the foreground the war ship Minneapolis. Thus there are brought together the last accession to the navy and the St. Louis, the beginning, it is to be hoped, of America's new mercantile marine. Each is a worthy representative of the best of their respective types.



THE LAUNCH OF THE ST. LOUIS OF THE AMERICAN LINE.

DR. OSLER, of Johns Hopkins, says that pneumonia can neither be aborted nor cut short. It is a self-limited disease and runs its course uninfluenced by any medicine we might administer.

Tobacco Cultivation in Cuba.

Pinar del Rio, the western province of Cuba, is given up almost entirely to the cultivation of tobacco. The plantations are scattered about in all directions, generally a mile or two apart. They consist of a number of small fields ("vegas") of about ten acres each, selected wherever the land is richest. The most of the land is entirely uncultivated. The tobacco seed is sown in nurseries, about ten pounds being used per acre. In October and November the young plants, when about three inches high, are bedded out in the tobacco fields, in furrows two feet apart. During the three months the plants take to reach their full size the greatest care is taken of them. Each plant is constantly examined, the green tobacco caterpillars killed, and the furrows kept perfectly clean with the plow. When the plant has grown its big leaves, generally about ten in number, all the small leaves are picked off the stalk, and on reaching its full height the head of the plant is also picked off. This allows the leaves to expand and spread out in the sun. The female plant gives the best leaves for capas (the outside wrapper of a cigar), as the leaves are larger and stronger. The color of the leaf is bright green until ready for picking, when it begins to turn yellow and spotty. They are then gathered by cutting the stalk in such manner that two leaves remain on each piece of stalk. The leaves are then strung over thin poles in the drying houses, one leaf each side of the pole, and left to dry about five weeks. The drying houses are large, airy barns, thatched with palm leaves, the inside being arranged with rows of poles one above another. On being taken down the leaves are put together in bundles of about 100 leaves, which are made into bales of usually eighty bundles and wrapped up in palm leaves. The bales are then ready for sale, and are taken in this state to the storing rooms of the cigar manufactories in Havana.—Consular Report.

Electric Conduit Roads.

At a recent meeting of the New York Electrical Society, Mr. Sachs gave a very intelligent description of what has been done in the past and what might be expected in the future. His paper received a full and exhaustive discussion of the problems involved, in which many of the very best authorities in this country took part.

The general consensus of opinion among those present was that there was no difficulty in constructing a conduit road that would work. Our own belief and contention, says Electricity, is that there is scarcely an electrician in the country but will deny that there are any mechanical or electrical difficulties that are insuperable. The mechanical difficulties are greater in the conduit than in the overhead system, but they can be overcome, if enough money is spent in the solution. The electrical difficulties are greater in the conduit than overhead, but if the conduit be made large enough, and the voltage be made low enough (which means, of course, more copper), these difficulties also may be overcome; so the question resolves itself in all directions into one of money. There is probably scarcely a practicing electrical engineer in the country who if asked if it were possible to construct an operative electric road upon the conduit plan, that would not answer unhesitatingly, "Yes." Why then has not this method become more popular? Simply because it is in competition with a better method. There is but one single feature of the conduit that recommends it above the overhead trolley, and that is one that appeals to the æsthetic side of our natures alone. In all other particulars the overhead system stands facile princeps. It is cheaper to construct; it is simpler, both mechanically and electrically; it gives better service and, more important for its survival than anything else, it is a better dividend payer. What incentive, therefore, is there to capital to an investment of half a dozen or more times the money for something which in its ideal perfection can only hope to equal that which we have already? Very little or none.

The Tallow Tree.

This tree is variously known as "tallow wood" (owing to its greasy nature when freshly cut), "turpentine tree," and "peppermint"—the foliage being remarkably rich in volatile oil. Another local name applied to it is "red shingy bark," owing to its red fibrous bark. Its botanical name is Eucalyptus microcorys. The term microcorys is made of two Greek words signifying "a little helmet," in allusion to the comparatively small cup of the flower.

An Udupussellawa planter writing to the Tropical Agriculturist bears testimony to the fact that "of all Australian trees introduced into Ceylon, the tree which has grown beyond all compare is E. microcorys. A specimen eight years old," he says, "was 5 feet 4 inches in girth, and tall in proportion."

The leaves of E. microcorys yield an essential oil, which it is thought may be useful in varnish making.

The gum is in many respects similar to the "kino" of Pterocarpus marsupium.

The timber, says Mr. Maiden, the Consulting Botanist to the N. S. Wales government, is one of the most valuable the colony produces; it is strong and durable under and above ground.

He mentions that it would be impossible to enumerate the various uses to which the timber can be put—among others being for naves, felloes, spokes, cop, flooring of buildings, decking bridge work in general, pickets, turned pillars, for mouldings and architraves; in fact, for all building purposes requiring durability.

An ink has been made by steeping chips of tallow wood in water for a day or two (presumably in contact with iron).

Against this timber it may be said that it is liable to attack by white ants, and that it does not hold nails well. On the other hand, the charcoal from tallow wood is thought by some to be one of the best for the smiths, and no timber suffers less by exposure after being cut down.

Quick Method for Chilling Test Pieces.

Writing on the use of liquid carbon dioxide for chilling test pieces, especially stone, iron, and steel, at low temperatures, M. Haller says that a cheap and simple form of apparatus in which the test specimens could be cooled would consist of a wooden box with double walls, top and bottom, the spaces between being filled with some non-conducting substance. The liquid gas could be led into such a box from the iron or steel flasks in which it is furnished, and would be deposited in great part in the form of frost at a temperature of about —78 degrees Centigrade. The test specimens could be readily put into and taken from such a box, and would quickly get to a low temperature. One of the Russian railroad companies is on the point of having such an apparatus constructed for testing rails and wheel tires at low temperatures. The possibility of accomplishing the desired object with such an outfit, viz., the rapid freezing of specimens, was demonstrated by putting a number of iron test pieces into a bag of several thicknesses of coarse cloth and then introducing the liquid gas. This at once became solid, and filled all the spaces between the specimens, which thus lay packed in snow. Each specimen was provided with a depression into which mercury could be poured, and on doing this, after a short exposure in the freezing bag, it was found that the mercury immediately soldified, showing, in the absence of a suitable thermometer, that the temperature of the specimens was certainly below —39 degrees Centigrade, if not lower. At the St. Petersburg Laboratory of Experimental Medicine a cold room of quite large proportions has been fitted up in which also liquid carbonic acid is the cooling agent.—Industrie Zeitung.

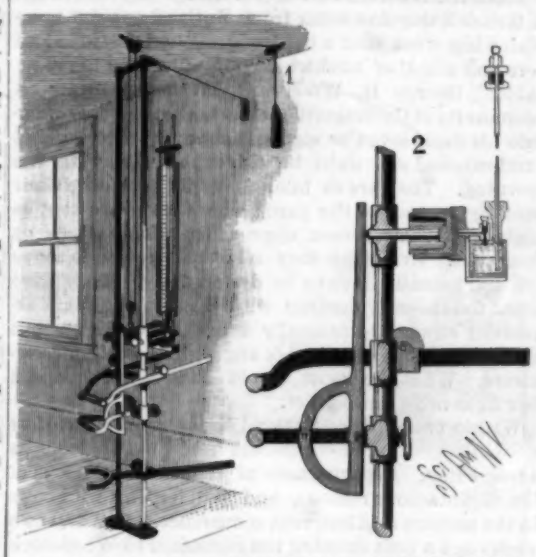
Alumina from Clay.

Suppose a clay of a known strength in alumina. For each mol of alumina we incorporate with the clay 3 mols. ammonium sulphate and an almost equal weight of neutral potassium sulphate; 1 mol. of potassium sulphate is theoretically sufficient. The whole is well worked up and made into hollow bricks. These bricks are baked at 270°—280°. The ammonium sulphate is then decomposed into acid ammonium sulphate and ammoniacal gas, which may be collected in a condenser. The acid of the acid ammonium sulphate is first thrown upon the neutral potassium sulphate, which becomes acid sulphate. The latter at this temperature, in presence of alumina and clay, is neutralized by the alumina, forming double aluminum and potassium sulphate, i. e., alum. The bricks are then extracted by methodic lixiviation. The silica may be used for cement. The alum is freed from iron by recrystallization, and the solution may be treated for the precipitation of the alumina by means of the ammonia which has been distilled off. To obtain the alumina in a granulated state it is spread out upon stages in a tower traversed from bottom to top by the hot moist ammonia obtained on baking the bricks. The alum is thus transformed into a mixture of ammonium and potassium sulphates and of granular alumina.—Joseph Heibling.

NEW DYNAMOMETER FOR USE IN ANTHROPOMETRY.

The modern method of making progress in any branch of science or mechanics consists in governing future practice by what has been learned by past experience, making every step looking toward advancement only after analysis of what has already been accomplished.

Dr. J. H. Kellogg, of Battle Creek, Mich., has applied this principle to the human body by means of



KELLOGG'S ANTHROPOMETRICAL DYNAMOMETER.

a very simple yet thoroughly practical machine, which he calls the universal dynamometer.

What the indicator and brake are to the steam engine, what the electrical dynamometer and other meters are to the dynamo, Dr. Kellogg's device is to the human body.

It is used for testing the strength of individual groups of muscles; in fact, it can be applied to every important group of muscles in the body, these groups numbering twenty-five for each side. It not only furnishes a basis for the scientific study of muscular dynamics, but it also furnishes a means of testing to secure accurate data on which to base prescriptions for exercise, so as to insure the scientific application of gymnastics to the correction of deviations from the normal standard of symmetry.

This apparatus, as will be seen by reference to the engraving, is simple. It does not show the amount of labor involved in bringing it to perfection. The frame consists of parallel standards secured to base and top pieces and braced. On these standards is placed a rest for the foot or leg, and above this a lever having an arm extending upwardly and bearing on a piston rod projecting from a piston, which acts through the medium of a body of oil and a layer of water on a column of mercury, serving the double purpose of an indicator and a resistance. The mercury column is inclosed by a glass tube and moves in front of a scale. The hydraulic cylinder is adjustable on the parallel rods and is counterbalanced by a weight attached to a cord running over pulleys. An adjustable rest is supported by the rods between the cylinder and the lever.

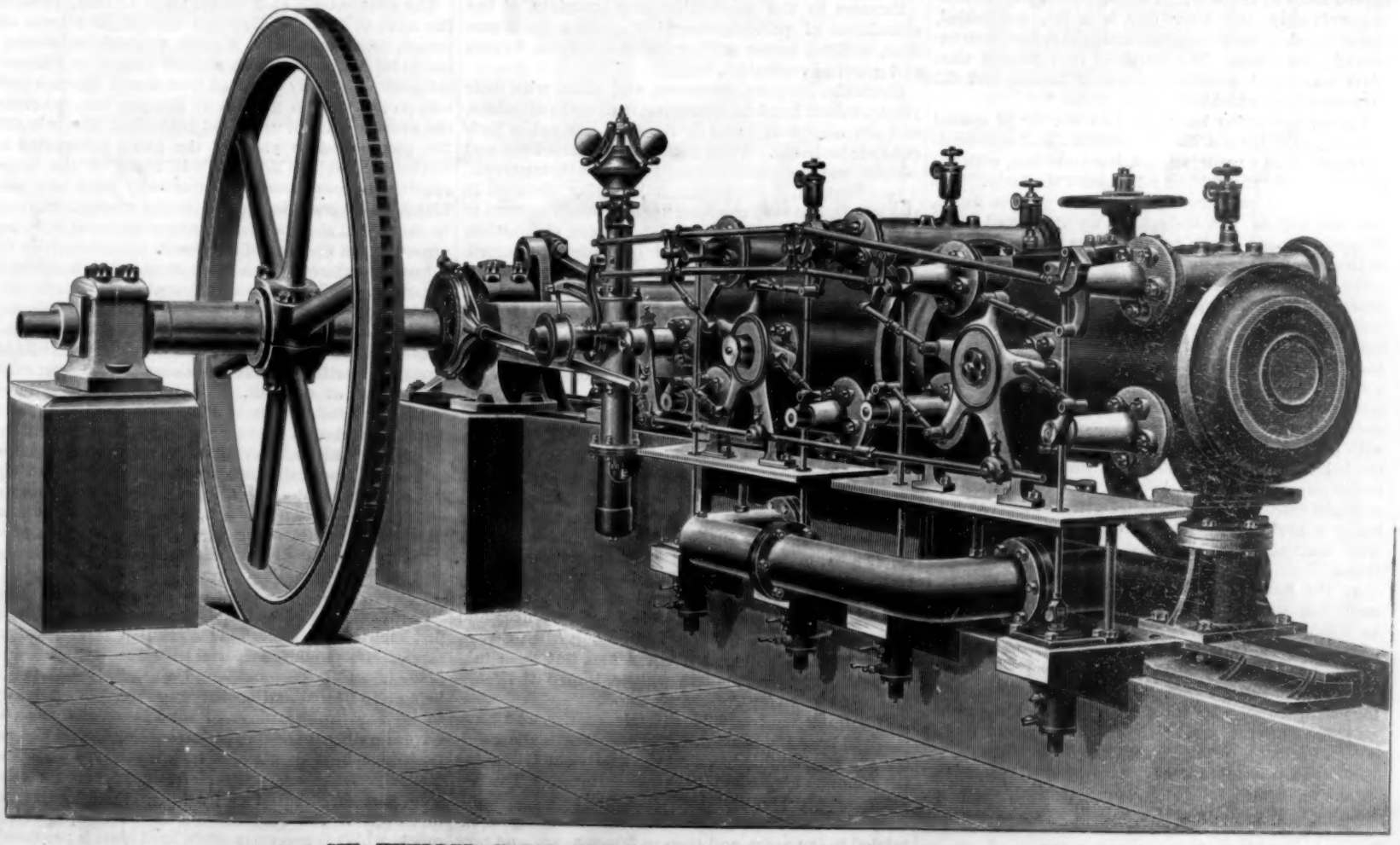
In connection with the dynamometer, Dr. Kellogg's "Percental Charts" are used for making a record of a given case. These charts are based upon the examination of hundreds of healthy men and women of different ages.

This dynamometer has been adopted by the government for testing cadets at West Point, and is in use at Yale University, Wisconsin State University, and in other places where special attention is given to physical culture.

TRIPLE EXPANSION ENGINE—FRIKART'S SYSTEM.

We illustrate herewith, from the Engineer, a triple expansion engine, which has lately been exhibited by Messrs. John Cockerill & Company, at the Antwerp Exhibition. In no country has the rotary valve, which is the main feature of the Corliss system, found more favor than in Belgium. All the large horizontal engines exhibited at Antwerp have valves of the Corliss type, though each manufacturer has a different method for regulating the admision and cut-off, which he considers superior to that adopted by rival makers. In Messrs. Cockerill's engines the system used is called the Frikart. They have for some time made single cylinder engines on this principle, and exhibit one of 100 indicated horse power, with cylinder 1 foot 7¾ inches diameter and 3 feet 5¼ inches stroke. This machine is used to drive a dynamo, and works very steadily under a varying load. The application of the Frikart valve to triple expansion engines is quite new, and the one exhibited at Antwerp is the first that has been made. It works at a pressure of 150 pounds, and its principal dimensions are: Diameter of high pressure cylinder, 1 foot 3¾ inches; intermediate, 1 foot 11⅝ inches; and low pressure, 3 feet 1¾ inches. The length of stroke is 3 feet 11¼ inches, and the number of revolutions is 80.

The chief characteristic of the Frikart valve is that by it any degree of cut-off from 0 to 75 per cent, or even more if necessary, can be obtained with a single eccentric, as the governor completely controls the admission. It is of the highest importance to be able to prolong the admission, as by this means the power of the machine to deal with extreme cases is greatly augmented. For instance, it may be required to exert increased power; or the pressure in the boiler may fall, either accidentally or because the fires are allowed to burn down before stopping the works. If, as in many machines when the admission of steam extends over more than four-tenths of the stroke, the cut-off only takes place toward the end, this sudden increase



SIX HUNDRED HORSE POWER TRIPLE EXPANSION CORLISS ENGINE.

in the admission will necessarily make a considerable, and possibly prejudicial, change in the speed. An arrangement by which the admission can be regulated so as to take place through any proportion of the entire length of the stroke is especially advantageous for compound and triple expansion engines, where there may be a large amount of steam admitted into each cylinder.

Our illustration is from a photograph showing the high pressure and intermediate cylinders, which are arranged as in a tandem engine. The low pressure cylinder drives a crank on the opposite side of the flywheel from the other two. The condenser and air pump are behind the low pressure cylinder, and in line with it. All three cylinders are steam jacketed; the steam for the jacket of the high pressure cylinder is direct from the boiler, that for the intermediate from the reservoir or steam chest between it and the high pressure, and that for the low pressure cylinder from the other reservoir between the intermediate and low pressure cylinders. These two steam reservoirs are under the floor, and the water which condenses in the jackets is drawn off by three separate pumps, and returned to the boiler. The engine has been designed for an effective horse power of 600.

Ancient City in Guatemala.

Besides the interesting archæological collection of the first capital of Guatemala, Santiago de los Cubeleros, now known as "Ciudad Vieja" (old city), a buried city has recently been discovered on the slopes of the Volcan de Agun, about a league east of the former, says the San Francisco Chronicle. It lies on the land of Manuel J. Alvarado, called the Pompeii plantation. Not the slightest tradition remains to connect it with the present age.

Two years ago the owner of the lands, finding a few ancient Indian relics, resolved to make excavations at different points. In one place, at a depth of twelve feet, he has taken out a great many rare and interesting objects, such as flower pots, earthen vessels for domestic use, ancient glazed ware, large vases of exceedingly fine manufacture, covered with engravings and with pictures in brilliant colors painted upon them, domestic utensils for the kitchen such as the Indians use to this day; axes, hammers, tomahawks and war clubs of stone; knives and daggers of obsidian, with sharp points and edges; lances and lancets of the same material, idols of stone and clay, well wrought jewelry of turquois and other precious stones, of all ordinary sizes and figures. Among the jewels was found a rare kind of precious stone of deep green color, known among the aborigines as the chal-chivilli stone, capable of the highest polish. This stone Indian royalty of long ago wore as the waist and breast ornaments on state occasions.

On some of the finest vases were artistically traced symbols and characters, the colors as fresh and brilliant as though they had just left the artist's hands.

Most of the clay idols are well formed. Some of the carved faces wear the tragic mask, but in one particular, evidently of a later day, is a fat, pot-bellied, round-faced, plump-cheeked little chap, the incarnation of good living. The people of that remote time must have had a certain sense of humor, and did reverence to this idol as the god of fun.*

Among the stone idols are two worthy of special note, chiseled from a hard brownstone and representing a person in a reclining, flat, front position, with the head erect and the chin on a line with the body. The head, face and neck are sculptured to a perfect finish, but the rest of the body is in an unfinished state. The contour and the expression of the well-cut features of the larger one is a most striking likeness to the features of the Roman race, while the smaller one represents the highest type of our Indian race. On the head of each is a remarkably well executed warrior's helmet, mounted with a clear cut tuft or crest of feathers hanging over a rimless front. Encircling it is a wide band, well upon the forehead, ornamented with quadrant figures in bass relief set closely one within another from the outer lines to the center, all arranged with perfect mathematical precision. In its makeup the helmet closely resembles that worn by the Prætorian guards of Rome. Another idol of natural size wrought from the same material attracts attention as being a perfect resemblance of the Mongolian race, with slanting moon eyes, flat nose and high cheek bones.

At the foundation level of the houses were found many human skeletons scattered about on the floors, as though they had fallen there by some sudden casualty, some in a sitting posture and others lying prone. Some of the skeletons measured from six to seven feet in length. Also within these buried dwellings were found many human skulls placed in a glazed clay vase ornamented with crude figures in gaudy colors. In some of these vases the heads were placed in an erect position, the chin on a level with the rim of the vase, and some were face upward, each one holding in his mouth a chal-chivilli stone wrought in the shape of the human tongue, and also another class of well wrought precious stone with a hole through it placed immediately under the nose. Evidently the latter had served as nose jewels. The foreheads of most of the skulls are broad and high, the cheek bones prominent and the chin projecting. It seems probable that this extinct race esteemed the head as the noblest part of the body, and at death had it severed from the trunk and kept as a sacred relic of the dead.

* Similar figures are common in Japan.

Increase of Wild Animals in Vermont.

From the Boston Journal we derive the following: A farmer living five miles from Rutland entered complaint last week that a herd of deer had destroyed an acre and a half of buckwheat and devoured his vegetables. George H. Woodward, of the mountainous community of Cuttingsville, reports that the deer come into his fields seven or eight strong every afternoon at sundown and stay until he drives them away in the morning. They are so tame they do not leave their feeding grounds or the yards where cows are kept at night until some person approaches within three or four rods. Even then they sometimes refuse to move off, and actually have to be driven away. They have great fondness for herding with domestic animals, especially cows. Occasionally a bull shows fight, but they seem not to care for his angry, threatening movements. What the result would be in a fair field and fair fight none can predict.

Within two miles of Rutland the other day, two deer were met trotting along the traveled road as docile as a house dog. Reports came of them in all sections of the mountainous regions, and the feeding with cows in the pasture is of frequent occurrence. One day two weeks ago a man crossing the mountain to Woodstock saw fifteen of the fleet-footed animals at close range. A fox hunter a fortnight ago ran into seven in the vicinity of Plymouth.

A reliable gentleman reports that a strange dog was running a deer last week over the mountains, near Rutland, but was lucky enough to keep out of range of a posse of enraged residents. Later in the day the deer, followed by the dog, came down into the highway, and, after traveling it for a full mile, started off over the hills toward the Bethel country. Those who saw it say that it was a fine, large buck, with big antlers. Many other incidents of recent date are talked about in that section.

Another animal that has increased rapidly in Vermont is what is commonly known as the hedgehog, or porcupine. A party of people of Rutland one night recently occupied a deserted house in a lumberman's camp in Mount Tabor. A pack of porcupines, attracted by the light or the smell of the food, or possibly the beer, attacked the shanty, and crawling up the sides to the roof, kept up a continual scratching and howling during the night. Several of them fell off the building, setting up fearful cries, greatly to the annoyance of the sleepers within, but all disappeared with break of day.

Farmers in the mountains also complain of the abundance of partridges, which overrun their gardens, making havoc with fruit and berries, flowers and growing vegetables.

Bears also are very numerous, and often, with their young, take a hand in destroying fruit and vegetables, and are almost as tame as the wild deer unless their cubs are molested. Their young are of varied size and weight, and are equally as destructive as their parents. These Vermont bears are not only getting plentiful in the woods, but they are learning how to avoid some of the annoyances that come with advanced civilization. Mr. Silas N. Wheeler has a hilly farm in Stamford. Mr. Wheeler recently went into a pasture and saw a good sized cub eating sweet apples. The animal was in a corner made by two barbed wire fences. He thought if he could entangle the young bear in the barbed wire fence he would have a good opportunity of killing him. He therefore drove him on the run for the fence, but the bear jumped over the top of the wire as nimbly as an athlete could do it and escaped in the woods.

Bears have often been seen roaming about the open country. One was seen the other day on what is known as Campbell Hill, on the quarter line road; in the vicinity of several residences another was roaming about with her cubs on an opening in the woods in a small mountain called Bald Mountain, both in plain sight of the city of Rutland and not far distant. On the eastern and southern outskirts of the city gardens have been invaded at night both by deer and bears. A deer was seen running along Allen Street, within the city limits, a few weeks ago, but soon taking fright at a locomotive whistle, leaped the fence and made haste for the nearby wood.

The protection the wild animals of Vermont have received from the State laws in the effort to allow animals to breed unhindered by the sportsman is likely to be somewhat modified in the near future. The law affecting deer is, and has been for years, prohibitive, and has been rigidly observed. It was first extended to ten years, and then to fifteen years, and now is operative until 1900, unless repealed or modified by the next Legislature, which meets in October. By this law the killing or capturing of deer, or the mere possession of its meat, is punishable by a fine of fifty dollars, and the informant of such deer-killing gets half the fine. A dog found pursuing a deer is liable to be shot.

The statutes affecting fur-bearing animals—mink, lynx, otter, and beaver—or those affecting wild birds are equally strict and rigidly enforced, except in the open season.

The increase in the number of noxious animals in Vermont is one of the unlooked-for results of the restrictive laws, for the forests are little hunted nowadays, and the bay of the deerhounds has not been heard for years. There is thus a vast and beautiful country up there among the mountains where the animals of the chase have increased and multiplied until the hard-working Vermont farmers have found in them a constant menace to their crops, and are crying aloud for protection.

Important Patent Case Before the Supreme Court.

The argument in the case involving the life of the Bate refrigerating patent, a process for freezing meats, was begun in the Supreme Court of the United States on November 15, by C. E. Mitchell, of Connecticut, ex-Commissioner of Patents, for the company. The case is probably the most important in the history of the Supreme Court, in view of the vast extent and value of the interests that will be affected by the decision.

The matter at issue is the construction of Section 4887, Revised Statutes, relating to the life of a patent granted by the United States upon an invention for which a foreign government has also granted a patent, and the particular question to be decided is: Does the date of application for the patent or the date of issue of the patent in the United States determine whether or not the term of the patent is to be limited by the term of the foreign patent?

The Bate Company brought suit for infringement of its patent against Schwarzschild & Sulzberger in the Southern District of New York, and the bill was there dismissed upon the defendants' plea that a patent had been issued in England upon the same invention between the dates of the application for and the issue of the patent in the United States, and that therefore the latter patent had expired with the English patent prior to the bringing of the suit.

The case went to the Court of Appeals, and that court has asked the Supreme Court of the United States to instruct it upon the question, in effect, "When did or when does the patent granted Bate in the United States expire?"

The decision of the court will affect the life of many important and valuable patents, notably in connection with the telephone and electric light, and the case is being closely watched by the attorneys of companies interested.

African Potassium Nitrate Fields.

The nitrate beds at Prieska, Cape Colony, present the most valuable and richest deposit of nitrate of potash ever found. It is a most valuable substance, not to be confounded with sodium nitrate or Chilean saltpeter, so largely exported from South America and sold on the London market at £10 per ton, whereas the average price of unrefined potassium nitrate is £16 10s. per ton. The yield of the farms prospected is virtually unlimited, and, while in many of the large kloofs enormous masses of practically pure salt are found, the average in the soil for the whole area may be calculated at 25 per cent. Attention need only be drawn to the working of nitrates in other countries to prove the richness of the most recent South African discovery. Soils containing nitrate of potash are worked in India and Ceylon when containing only 2½ to 5 per cent, and the richest deposits in those countries rarely contain more than 8 per cent, while in Hungary nitriferous soils containing ½ to 2½ per cent are worked at a profit. The Cape deposit is most easily extracted, merely by lixiviation, by hot or cold water, decantation of the clear liquor from the soil into shallow tanks, and evaporation by the rays of the sun, when practically pure nitrate crystallizes out. By this process nitrates on a large scale could be produced at less than £2 per ton, and the cost of transport over 140 miles of country to De Aar, and thence by rail and sea to Europe, is £5 per ton.—Engineering and Mining Journal.

A FRENCH process of casting hard glass consists in first melting the material in a peculiar tank furnace, tapped into moulds, a special substance being used in place of sand, the mould and the glass inside of it being also heated and cooled together. The mixture to be used in the place of sand is selected so as to have as nearly as possible the same conductivity and capacity for heat as glass, in such a case the glass and mould forming, as it were, one homogeneous body. The glass thus treated cools, it is said, without cracking, even if the cooling process be comparatively quick, which is necessary when hard glass is produced.

THE LEADING AND GLASS PAINTING INDUSTRY.

Glass painting is supposed to have attained its first great development in Italy in the thirteenth century. The French also claim the honor of inventing the process of painting upon the mosaic windows of colored glass and transforming them into works of art and also teaching it to the English, who in their turn instructed the Germans. The oldest specimen of glass painting now existing is a window of the thirteenth century, in a church at Neuwiller, in Alsace, representing St. Timothy. The glass used at the present time is bought from the manufacturer in colored sheets about five feet in length and about two feet in width and running from one-sixteenth to one-eighth of an inch in thickness. The colors mostly in use are the rubies, yellows, blues and emerald greens. These colors are produced by adding to the material in the melting pot small quantities of various metallic oxides and other mineral substances. The colors yielded vary in intensity according to the proportion of oxides used. Colored glass is used principally for ornamental windows in churches, public buildings, private residences, signal lights, and for imitation of precious stones. Some of the styles of glass, such as the antique and cathedral, unless held up to the light, have a dead appearance. Opal is a glass that is clear, the sheets being both smooth and corrugated. Venetian is a rough and smooth glass polished on both sides. Parties ordering ornamental windows have a small colored design of the window submitted to them for their approval by the artist. If accepted, two outline drawings are then made the exact size of the window, showing the shapes and forms into which the glass is to be cut. The forms or patterns are then cut out of one drawing and used as a guide for the glass cutter. The paper strip, representing either a square, circle, or diamond, etc., is held down firmly on a sheet of glass by one hand of the operator, while with the other he draws a diamond around the edge, cutting or scoring the glass, which, by tapping it lightly, separates the piece from the sheet. This operation is repeated until all the parts have been cut. In olden times the glass was cut by the aid of a hot iron, and was also reduced to the correct shape by a grosing iron, the diamond not coming into use before the seventeenth century. If figures, animals, flowers, etc., are to be painted on glass, the outline of the design is first traced on with a solution composed of a black or brown mineral paint, pulverized glass and oil. The pieces or parts of the glass on which the outline is drawn are then placed into a firing kiln. The kiln is made of sheet iron of different sizes, having at the top an iron shelf on which the glass is placed. The surface of this shelf is first covered over with whiting to keep it from coming in contact with the iron. The glass is then laid on and the cover of the kiln, which has an outlet for the heat at the top, is fastened down. The kiln is then heated by means of a number of gas jets attached to two circular reservoirs which are connected to a gas pipe at the bottom of the kiln. The heat from the jets causes the paint to melt and fuse into the glass. The firing operation takes from two to ten hours. The firing is completed when the color of the glass is between a red and a white heat. After fusing, the kiln is then allowed to cool. When the glass is sufficiently cooled, it is taken from the kiln and attached to an easel formed of a large transparent sheet of glass. The shadows and middle tints are then painted in the highest lights, being the pure color of the glass. The deepest shadows are solid black, produced by painting the color on thickly. The pieces, when painted, are again put into the kiln and fired in the same manner as before. The color on the glass is opaque when put into the kiln, the action of the heat causing it to become transparent. The color used formerly was a mixture of pulverized copper, pulverized green glass and sapphire, the three ingredients being ground on the same stone with wine or urine and put into an iron vessel ready for painting. The glass strips, whether plain or painted, are then leaded. Each piece of glass is cut a little smaller than the pattern in the working plan, so that the piece, when leaded, will exactly fit the pattern. The ribbon or lead strip is first run through a mill containing two dies, which forces or presses the strip into the right shape and thickness. These strips are grooved on two sides and are wrapped around the edges of the glass by hand. Each leaded piece, beginning with the border, is then placed over the corresponding pattern on the working plan, each strip being held in place by means of nails driven along the sides until all of the pieces which compose the window are leaded. The joints are then soldered. The operation is performed with the common soldering iron with a solder composed of tin and lead. The irons are heated in an oval shaped gas stove about sixteen inches in length and about eight inches in height and width, and lined on the interior with fire brick, the jets of gas heating the stove and irons from the bottom. Before soldering each joint is rubbed over with an adamantine candle, which causes the solder to stick. A number of odd-shaped knives are used for the purpose of lifting up the glass in place, and also for smoothing down and trimming the lead joints. The jewels are made in different sizes, colors and shapes, some being oval, round and oblong; some are rough and others highly polished. A great number of stones, pebbles and clam shells are also used as jewels.

After the soldering operation is finished it passes through the cementing process. A cement composed of red lead, oil and drier is rubbed over the leaded window with a stiff brush, the rubbing forcing the cement underneath the overlapping joints, making them watertight when hard. The surplus cement is then cleaned off and the window dried by rubbing a quantity of whiting over the surface. From one to three pounds is required to lead a square foot of glass, the operation taking about two hours. The leaded windows are sold by the square foot, ranging in price from $1 upward. Fifteen hands can turn out about 1,000 square feet monthly. The sketches were taken from the plant of Charles Maginn, New York City.

THE LEADING AND GLASS PAINTING INDUSTRY.

Motor Men Must be Protected.

The constitutionality of the street car vestibule law in Ohio is upheld by the Supreme Court of that State in a decision recently handed down. The law was passed in April, 1893, and requires all companies to provide electric cars with vestibules to protect the motor men from the severity of the weather during the winter months. This has already been done voluntarily in several Eastern cities, and a number of States, including Minnesota, have passed similar laws. It seem that the Ohio companies opposed the law, and the lower courts generally held that the statute was unconstitutional. This decision has now been reversed by the Supreme Court of the State.

Riverside, California.

A correspondent of the N. Y. Tribune writes as follows:

To one who drives through the shaded avenues of Riverside and notes the superb orange and fig trees towering far above the roofs of the houses, it seems scarcely credible that twenty-three years ago this garden spot was a dreary, barren plain, known among those who used the road that passed through it as the most wind-swept spot for leagues around. The beauty of its outlook on the snow-capped San Bernardino Mountains and its proximity to the Santa Ana River commended the place to the founders, who came mainly from the Mississippi Valley States. These men had the usual hard fortune of pioneers. When they settled here in 1871 and began to plant their twenty-acre tracts, the fig and the raisin grape were the favorites with California horticulturists. So these two were planted. The fig has never been a product that could be handled with profit here, because the California grower has failed to acquire the skill in packing of the Smyrna dealer. The raisin also was voted a failure at the outset, because the process of curing was not scientific, as it is to-day.

So the men who planted figs and vines rooted up and burned them, and started in afresh with the budded navel orange. They were laughed at by those who had grown the seedling orange at San Bernardino and other places. They were told that this new and tender variety would never endure the occasional frosts. But the great majority were shrewd enough to see the immense prospective market for a sweet, juicy orange without seeds, and their good judgment was soon demonstrated. When it was proved that the orange could be depended upon, in good seasons and bad, to produce $250 to the acre above all expenses, there was a great rush to plant it. Young trees only two years old actually sold as high as $1.50 each and for several seasons never fell below $1 a tree. Nurserymen made fortunes while this orange boom lasted. Now you may buy the choicest young orange trees for 25 cents each and the standard price is 10 cents. Yet the planting in the great boom years was not so great as now, when values have settled to a reasonable level and the craze for speculation in town lots has become only a memory.

It is ten years since the writer saw Riverside, and the changes made in this decade are enough to make one doubt the accuracy of his senses. In 1884 Riverside had just been incorporated as a city. Its population was 2,500 and its property was valued at $1,000,000. It had just begun to establish a reputation as one of the best orange growing sections of California. Now its population is 7,500 and its assessed valuation is over $6,000,000. Last year it became the county seat of the new county of Riverside. Its shipments of oranges average $1,500,000 a year. It has forty-six miles of main canals and over 200 miles of lateral ditches and pipes. One entire suburb, which ten years ago was a barren mesa, has been transformed by artesian wells into a garden. The same system of development is going on all around Riverside and it bids fair in a few years to make this rolling plain between the coast range and the San Bernardino Mountains one continuous orange grove and vineyard.

Riverside is forty miles from the ocean as the crow flies and sixty miles due east from Los Angeles. It lies at an altitude of 1,000 feet above sea level. The ocean breezes reach it every afternoon, except in the fall, when the trade winds fail to blow. The mountains, only thirty miles away, make the nights cool and pleasant. It is removed from the main lines of railroad travel, yet it is closely connected with both the Southern Pacific and the Santa Fé systems In winter there is an occasional frost that damages the oranges, but these disasters are not so frequent or so serious as in Florida.

A drive through Magnolia Avenue gives the stranger the best idea of Riverside and the causes of its prosperity. The name of this drive is a misnomer, though it is beautifully shaded by peppers, eucalyptus, fan palms and grevillas, there is almost an entire absence of the magnolia, which failed to flourish. This avenue is lined with three rows of trees, one on each side and one in the center. These trees have now reached a height of thirty feet, and cast a delightful shade upon the hard, smooth road. Upon either side are orange groves, that come almost to the artificial stone sidewalk. Few division fences or even hedges are seen. One passes house after house, built in the old-fashioned Southern style, with verandas around three sides, and with roses and other plants climbing over the doors and windows. A few places have lawns and ornamental shrubs, but in the great majority every bit of land has been utilized. Yet the beauty of the foliage of the orange, relieved as it is during several weeks by the golden fruit, makes even the homes without flower gardens a delight to the eye.

It is a constant surprise to turn from these spacious houses, surrounded by orange groves, to the avenue in front, with its artificial stone sidewalks, its street railroad, its electric lights, its postoffice boxes, and all the usual features of city life. Yet this intimate union of the country and town life is the chief thing which sets Riverside apart from most other California colony towns. The town has the Waring system of sewerage: the streets are sprinkled constantly, so that one may ride for a whole morning and not be annoyed with dust; the water supply is so arranged that all the water for drinking and household purposes is aerated as it leaves the covered reservoir, and is brought in pipes to the town. No barroom is permitted within the city limits.

The feature of Riverside that excites the astonishment of the stranger is the spread of the city over the neighboring hills. The old town was laid out on the level land, near the river, but all the later development has been on the high, rolling plains that stretch back to the mountains. These plains are broken by buttes, or small mountains. One of the prettiest of these hills is Arlington Heights, which boasts of a handsome driveway called Victoria Avenue, stretching for ten miles parallel to Magnolia Avenue. Another is Victoria Heights, from which one may obtain a superb view of all the orange-producing country from Riverside to old San Bernardino—a country which in twenty years will show few acres not planted with the orange or other fruit tree.

Perhaps the most remarkable thing in the development of Riverside is the perfection of the water supply. The men who founded the town were far-seeing enough to obtain a large supply of water for irrigation, but even this was soon seen to be inadequate. Tracts of the finest land lay too high for the river water to reach them. Without water they were worth not more than $10 per acre for agricultural purposes, as no crop could be expected in a dry year. With water they would easily sell for $250 an acre. A poor carpenter of Riverside, Matthew Gage, studied this problem of supplying the high lands with water. He finally concluded from experiments that artesian water could be reached anywhere on these mesa lands. So he obtained financial backing, bought up all this land at a low price, and then sunk his wells. He soon had a fine flow, and by piping the water to all parts of the tract he had 3,000 acres adapted to the orange and lemon. His company has sold 2,000 acres, which are now planted to the citrus and deciduous fruits. This planting has transformed a hideous, barren plain into one continuous orchard and garden.

Everywhere about Riverside one sees the signs of the life-giving water. As you approach old Riverside you pass across the Santa Ana River, from which runs an irrigating flume 7,000 feet long. At its end is a tunnel 3,000 feet long, which carries the main ditch through the heart of a high hill. The main ditch that passes through the town is ten feet wide at the bottom, and the sides are as carefully cemented as if they were the floor of a household cellar. Many of the lateral ditches that supply the groves are open, but these are kept beautifully clean, and the running water is an ornament, for it makes one forget the fierce heat of the midsummer sun.

One Aim in Business.

Probably nothing would more effectually serve to elevate every honest occupation, and to ennoble every worker therein, than a realizing sense of the service thus rendered to the community. Most people pursue their various employments as a means of livelihood, or of increasing their personal advantages and comforts, and these motives are perfectly justifiable. The mistake they make is that they have no other. They do not reflect that their work is also a means of promoting the welfare of the community; or if they admit the fact, it does not come home to them in that impressive way which would lead them to receive it as an aim to be achieved. There are a few pursuits where it is expected that this end will be kept in view, and where the worker that has within him no motive but that of self-interest is held to have degraded his high calling, but that all employments demand so high a standard of action is an idea floating in the air, perhaps, but by no means brought into general or practical use.

In commercial life, for example, the profit of the individual usually occupies so large a proportion of the attention that but little is left for the real benefits which commerce itself bestows upon the people at large. That it furnishes a livelihood to multitudes and fortunes to some, are by no means the greatest of its benefactions. Its contribution to the comfort and convenience of the public by bringing necessities and enjoyments within the easy reach of all is incalculable. In this respect alone it is one of the chief factors of civilization. But it does much more than this. It draws men together by common interests. It binds the East to the West and the North to the South. It even unites countries between which oceans roll, enabling various nations to mingle, and thus to understand and to respect each other. By encouraging travel it spreads ideas and methods, conserving and establishing the best, and planting them where they have hitherto been unknown. Thus, through the influence of commercial enterprise, the differences that mark different states and nations, instead of proving insuperable barriers to friendly intercourse, are made to subserve mutual improvement and to enable each one to make continual advance.

There is another and even more important benefit which commerce bestows upon society, that of increasing trust and confidence by promoting honesty and equity. We hear and read of so many instances of cheating and overreaching in trade that we forget that these are the exceptions and not the rule. Every case of dishonesty is pointed out and emphasized, while of the thousands of honorable merchants and tradesmen of all kinds nothing is said. We are accustomed to think much of the great temptations to unfairness and double dealing that beset the young man entering business, and it is well that he should be put upon his guard against them, but it is also true that mercantile life as a whole is a school wherein integrity and rectitude must be among the chief lessons. For commerce is built upon trust, and whatever shakes or undermines that trust weakens the whole structure. If roguery and unfaithfulness were general, the foundations of business would give way, and commercial enterprise would no longer be possible. It is but a poor and temporary gain that the shortsighted swindler or the dishonest trader obtains. He is speedily discovered and shunned, and sooner or later is ostracized from the business world as completely as the sensualist or the drunkard is ostracized from good society. True gain is not the transference of money from one man's purse to another, without adequate return, but the increase of social welfare by efficient and intelligent labor. When this is realized and acted upon, commerce will attain a sure and permanent success, in which all engaged in it will be sharers.

Thus, while business life depends for its true prosperity upon good faith, rectitude and honor, so in its turn it fosters and encourages these virtues. Mr. Lecky, in his "History of European Morals," speaks of industrial veracity as that "accuracy of statement or fidelity to engagements which is commonly meant when we speak of a truthful man. . . . This form of veracity is usually the special virtue of an industrial nation, for, although industrial enterprise affords great temptation to deception, mutual confidence, and, therefore, strict truthfulness, are in these occupations so transcendently important that they acquire in the minds of men a value that they had never before possessed." If this be so, it gives to business life an ethical character that is seldom accorded to it. Nor do the virtues it inculcates end with itself. When we occupy a high standard of action in one part of life, it raises that of all the rest. One who has been accustomed to be faithful and loyal in his home is not likely to be false in his friendships, and if business requires integrity in its followers, the seeds thus sown will blossom out in other spheres, and thus a better character, as a whole, will result as the fruits of its influence. Is not such a result worth reflecting on and planning for? Do not let us lose sight of it in the effort for personal gain. Let us ponder on the good of trade, not only to the individual trader, but also to the community, to the nation, to the world. Just as the faithful physician feels himself bound by the honor of his profession to promote health and alleviate suffering, so let the upright merchant realize the noble mission of his occupation and strive to do his share toward furthering it. The duty of service comes to us all, and nothing tends more directly to elevate our employment and to dignify our relation to it than to hold this duty close to our hearts and prominent in our lives.—Public Ledger.

Work versus Worry.

It is a well understood fact that it is not work that kills, says the Massachusetts Medical Journal, but worry, and from this text some most sensible and profitable hygienic discourses have been preached during recent years. The conclusion of the whole matter is this: Brain work is conducive to health and longevity, while brain worry causes disease and shortens life. The truth of this statement, and its application to what we see around us, are evident enough; yet it is well that such subjects should be continually discussed. A life of intellectual labor, although severe, like that performed by the judges of our highest courts, or by scholars and persons devoted to literary pursuits, if unmixed with excitement, and followed with regularity, is not only a happy life, but is seen also to promote bodily health and long life. On the other hand, mental cares, attended with suppressed emotions, and occupations which from their nature are subject to great vicissitudes of fortune and constant anxiety, break down the lives of the strongest. Every one has seen a class of men whose early mental training was deficient, and to whom the writing of memoranda was irksome, engaged in middle life in great undertakings, and taxing the memory with a mass of complicated business accounts, simply because they could more easily remember than write. Their powery of memory for a certain kind of facts is often truly astonishing; but the strain is at last too much, and they die before their time. The brain worry of our school children might furnish useful illustrations of the truth of the same general proposition, but we forbear. "Don't worry."

RECENTLY PATENTED INVENTIONS.

Mechanical.

DRIVE GEAR MECHANISM FOR BICYCLES, ETC.—Stephen Kaltonik, Punxsutawney, Pa. This invention has for its object the propulsion of bicycles, tricycles, etc. A driving gear is supplied, including spring-actuated means which will assist in propelling the machine and permit the rider to rest while passing over level grades. By another device the vibrating weight pressure of the rider on the seat spring bar will assist in propelling the machine. The auxiliary spring-driving mechanism will be of assistance in climbing hills and is arranged to prevent a retrograde movement.

VEHICLE WHEEL.—F. and T. F. Mendenhall, Moorepark, Mich. The object of this invention is to produce a wheel which has the usual spokes and fellies and in addition certain devices by which the length of the spokes may be regulated and the felly sections spread. All rattling and looseness may be obviated by adjusting the spokes and fellies by the devices provided. The adjusting mechanism is protected so that it will not become clogged with dirt and dust and also adds to the strength of the wheel.

CLOTHES RACK.—Theodore M. Anderson, New Whatcom, Washington. This novel clothes rack consists of a post secured at its lower extremity by a bracket fixed to a wall; the upper extremity is secured to the ceiling. To this post is fastened a carrier moving vertically. This carrier is provided with arms, the number of which can be varied at will. When not in use the whole apparatus, except the ceiling socket and bracket, may be removed.

CAN OPENER.—Charles F. Keller, Danville, Cal. This invention is for readily opening a can without danger of injury to the hands. An eccentric raises the can until the top of it is engaged by the top of the opener, which is secured to an arm which is connected to the base by an upright. The cutting is done by a rotating knife, motion to which is imparted from a crank by the medium of bevel wheels. The action of the knife not only cuts the top, but forces the edges of the metal upward, forming an upwardly projecting burr. After the knife has completed or nearly completed its revolution, the eccentric is turned backward, releasing the can.

Miscellaneous.

HEATER.—Charles B. Wanamaker, of Allentown, Pa., assignor of one-half to W. H. Hunsicker, of the same place. This invention consists of a heating chamber, a water chamber surrounding it, and a coil of pipe around a magazine tube. The return water is received in the bottom of a casing from which it passes to the upper part and into the coil, where it is rapidly heated. From thence it passes off through the outflow pipes. Various arrangements are provided to obtain the maximum effect of the combustion of gases.

STOVE PIPE ATTACHMENT.—Wellington Wilson, Bay City, Michigan. This invention relates to means for attaching stove pipes to chimneys, also which may serve to hold in place the usual slip collar on the stove pipe that closes the marginal portion of the opening in the chimney wall through which the stove pipe enters. The device prevents the pipe from being put too far into the chimney. The new attachment consists of heavy wire with one end coiled to engage the stove pipe at the chimney end. The end of this wire is bent to secure the pipe against the chimney. The other end of the wire is provided with an anchor for securing it to the pipe, and a portion of it is bent so as to hold the collar in place.

NEW BOOKS AND PUBLICATIONS.

THE ROMANCE OF SCIENCE SERIES. Our Secret Friends and Foes. By Percy Faraday Frankland. London: Society for Promoting Christian Knowledge. New York: E. & J. B. Young & Co. 1894. Pp. vii, 204. Price $1.20. No index.

In the modern days of bacteria, this book appears to be particularly timely. It describes the methods of micro-organism analysis and the numerous and curious experiments which have been performed by bacteriologists. Disease and its prevention naturally enter into the scope of the work, which is one of the Romance of Science Series, other numbers of which we have already had to praise. The eminence of Frankland's name is enough to give this work its standing.

A LABORATORY MANUAL IN ELEMENTARY BIOLOGY. An inductive study in animal and plant morphology. By Emanuel R. Boyer. Boston: D. C. Heath & Co. 1894. Pp. xxii, 235. Price 80 cents. With index.

We have of late reviewed many books treating of inductive education, especially as applied to physics. Here we have the same style of work applied to biology, the pupil being made by his own exertions to carry out the course. There is very little question that with the great mass of people this is the best method of education, and will have the most valuable effect in teaching observation and in opening their eyes to the world directly surrounding them. We have little doubt that the elementary treatment of the subject was really exacted by the uses for which the book is designed.

MANUAL OF MILITARY FIELD ENGINEERING FOR THE USE OF OFFICERS AND TROOPS OF THE LINE. Prepared at the United States Infantry and Cavalry School by the Department of Engineering. Captain William D. Beach, Third Cavalry, Instructor. Fort Leavenworth, Kansas. 1894. Pp. 283. Price $1.75. With index.

This is an official government work on military engineering published by the Fort Leavenworth School, a station where officers in the regular service prosecute the studies which they have begun at West Point. The matter is quite interesting to many not connected with the army, but in civilian engineering practice. It has an excellent index.

CENTRAL STATION BOOKKEEPING AND SUGGESTED FORMS. With an Appendix for Street Railways. By Horatio A. Foster. New York: The W. J. Johnston Company, Limited. 1894. Pp. 139. Price $2.50. No index.

There is no doubt that such a work as the present one, describing how an accurate system of books can be kept at central stations and how profit and loss can be closely determined, will be found acceptable by electrical station superintendents. The power to impart the status of the business, above all, is now requisite, when there is such a tendency in municipalities to undertake electric works. This system of bookkeeping will show this exact status from the aspect of dividends, and cannot but be of value in order to enable municipalities to form correct ideas as to the money value of these institutions, so that they may not be carried off by false ideas as to profitableness.

THE UNTEMPERED WIND. By Joanna E. Wood. New York: J. Selwin Tait & Sons. Pp. 314. Price, cloth $1; paper 50 cents.

ELECTRICITY AT THE COLUMBIAN EXPOSITION. By J. P. Barrett. Chicago. 1894. Pp. xv, 501. No index.

Mr. Barrett, Chief of the Department of Electricity at the Columbian Exposition, in this report describes the general line of exhibits there presented. It contains numerous illustrations and is altogether an extremely acceptable presentation of what was there shown. Curiously enough an index is wanting, something which, in a book of this character, one would suppose to be a matter of course. Some of the illustrations showing the electric light effects at the Fair are most beautiful and effective. A portrait of Mr. Barrett seated at his writing desk forms the frontispiece.

PRACTICAL APPLICATION OF THE INDICATOR WITH REFERENCE TO THE ADJUSTMENT OF VALVE GEAR ON ALL STYLES OF ENGINES. By Lewis M. Ellison. Chicago. 1894. Pp. 197. Price $2. With index.

Works on the indicator are always welcome. The present volume attacks the subject from a peculiarly practical aspect. It goes into what should be done to cause an engine to work correctly, showing what constitutes a good and a bad indicator card, and how errors in the working of an engine are disclosed and how they can be remedied. A really good index would be an addition to the work, but the two page table of contents given under that name does not deal adequately with the subject.

BIBLE, SCIENCE, AND FAITH. By the Rev. J. A. Zahm. Baltimore: John Murphy & Co. 1894. Pp. 316. Price $1.25. No index.

Professor Zahm is well known to physicists by his work on sound and music, certainly one of the best monographs on this topic which has yet appeared in the English language. In the present work he applies himself to showing the accord of the Bible with science. The book cannot be reviewed adequately here, but may be, from the authority of the author and from its make up in general, recommended to our readers. It contains no index, but perhaps the nature of the subject is such as to render an index hardly a requisite.

KITCHEN BOILER CONNECTIONS. A selection of practical letters and articles relating to water backs and range boilers, compiled from the Metal Worker. New York: David Williams. 1894. Pp. 129. Price $1. With index.

The Metal Worker produces in this volume a number of queries with answers thereto, which have appeared in that paper. It will be seen that any plumber who is troubled to make boilers work satisfactorily will here find his troubles alleviated. It contains numerous illustrations and throughout is highly practical from the standpoint of the plumber. It contains a table of contents and an index.

THE LIFE AND INVENTIONS OF THOMAS ALVA EDISON. By W. K. L. Dickson and Antonia Dickson. New York and Boston: Thomas Crowell & Co. Pp. xvi, 362. Price $4.50. No index.

This work leaves nothing to be desired from the point of view of make up, the paper, typography and illustrations all being most elegant. The matter is largely made up of articles which have already appeared in Cassier's Magazine and in the Century Magazine. It is entirely in the popular style, in all its treatment of topics, one of the points being distinctively the praising of Mr. Edison's achievements. His portrait in various positions, and portraits of his wife and children, and scenes at his private residence, are also embodied in the work, so that it reveals much of his private life. Among the illustrations, some of the most interesting are those obtained by Mr. Bicalton in Asia.

A DICTIONARY OF ELECTRICAL WORDS, TERMS AND PHRASES. By Edwin J. Houston. Third edition. With appendix. Greatly enlarged. New York: The W. J. Johnston Company, Limited. 1894. Pp. vi, 667. Price $5. No index.

In Mr. Houston's new electrical dictionary we have found the matter of the last preceding edition with an appendix of upward of one hundred pages added to it. This brings it pretty well up to date. The same system of cross references is carried through the appendix that is used in the original work. This, of course, involves a large amount of repetition, which, however, is unavoidable from the plan of the work. It embodies no index. Our review of the last edition will therefore cover the present, for the additional matter involves the only change of importance.

WILSON'S CYCLOPEDIC PHOTOGRAPHY. A complete handbook of the terms, processes, formulæ and appliances available in photography, arranged in cyclopedic form for ready reference. By Edward L. Wilson. New York: Edward L. Wilson. 1894. Pp. 480. Price $4. No index.

The present work, although, to quote the preface, "kind indulgence must be asked for the numerous errors," will doubtless prove very useful to photographers. The different topics are given in dictionary form, from a few words to several pages being devoted to each one. Illustrations are used where required. In many parts the work would be greatly benefited by revision.

ANNUAL REPORT OF THE CHIEF OF ORDNANCE TO THE SECRETARY OF WAR. For the fiscal year ended June 30, 1893. Washington: Government Printing Office. 1893. Pp. 739.

This report, in view of its illustrations, of the interest now being taken in arms of war, and on account of the really popular nature of the treatment of some of the subjects, will be found of much greater interest than is generally the case with federal publications. It is needless to say that to army officers and gun manufacturers the work will be absolutely a sine qua non.

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(6302) P. H. W. asks: How much and what size of wire to use on a small dynamo, to get 110 volts and 8 amperes, on field and armature, also whether to connect it up in shunt or series. Does putting more and smaller wire on the armature increase the voltage or current and what is the cause? A. These are matters of calculation. Sloane's "Arithmetic of Electricity," $1 by mail, gives examples. Smaller wire on the armature increases voltage by causing more lines of force to be cut per unit of time. It decreases the amperage by increasing the resistance. 2. In your paper you once said, if a 1 horse power machine was doubled in all its lineal measurements, it would have just 64 times more power. Is this correct? A. The relative power of dynamos and motors varies approximately with the sixth power of the size. Some authorities however take the fifth power $(2)^5=64$.

(6303) W. F. says: Since June 21 to November 1 the days have shortened 4 hours 5 minutes, namely, 2 hours 2 minutes in the A. M. and 2 hours 48 minutes in the P. M. Why is it not equal? A. The position of the sun in relation to mean or clock time is continually changing throughout the year, caused by the elliptic form of the earth's orbit and the position of the sun in one of its foci. Thus the sun comes to the noon mark behind the clock time from December 24 to April 15 amounting to 15 minutes about February 10. From April 15 to June 15, it is ahead of clock time, amounting to 4 minutes about May 15. From June 15 it falls behind clock time, reaching 6 minutes on July 28, and again coinciding with the clock on August 31. Then again ahead of clock time, reaching the maximum of 16¼ minutes about October 27, receding to meet the clock on December 24. The sun's time equation compensates the difference in the clock time of rising and setting of the sun throughout the year.

(6304) F. R. B. writes: I have lately made a fish pond and would like to know if there is any way of giving fish air during winter time besides cutting a hole in the ice? A. A small hole only is needed in the ice, through which a pipe may be inserted and air blown under the ice as often as required by a bellows or air pump. With a hand-driven air pump the tube can be thrust down to the bottom and the water thoroughly aerated.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

November 13, 1894,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

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Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.